DINAMAP™ *Compact* Vital Signs Monitor

Portable Adult/Pediatric and Neonatal Monitoring

Service Manual

Part No: 776-856

GE Medical Systems
Information Technologies

We bring good things to life.

List of Effective Pages

Part No./Rev	Page No.	Date of Latest Revision
776856	All	Original (May. 2000)
776856B	All	June 2001

U.S. Patent 5,579,776
U.S. Patent 5,170,795
U.S. Patent 4,349,034
U.S. Patent 5,052,397
U.S. Patent 4,360,029
U.S. Patent 4,543,962
Patents Pending

U.S. Patent 4,754,761
U.S. Patent 4,501,280
U.S. Patent 4,638,810
U.S. Patent 4,546,775
U.S. Patent 4,638,810
U.S. Patent 4,546,775
U.S. Patent 5,518,000

European Patents:
104771 104772 217918 225256 335357

CAUTION: Federal (U.S.A.) law restricts this device to sale by or on order of a health care practitioner.

The contents of this document, including all figures and drawings, is proprietary information of GE Medical Systems, provided solely for purposes of operation, maintenance, or repair of Dinamap™ Compact Monitors.

Dissemination for other purposes or copying thereof without the prior written consent of GE Medical Systems, Tampa, Florida, is prohibited. Illustrations may show design models; production units may incorporate changes.

©GE Medical Systems *Information Technologies* 2001 TAMPA, FL 33614
Printed in the U.S.A. All rights reserved.

Reissues and Updates
Changes occurring between issues are addressed through Change Information Sheets and replacement pages. If a Change Information Sheet does not accompany this manual, it is correct as printed.

Errors & Omissions Excepted
If, in the normal use of this manual, errors, or incorrect data are found, please notify:

United States
GE Medical Systems *Information Technologies*.
4502 Woodland Corporate Boulevard
Tampa, FL 33614

United Kingdom
Monitor House
Unit 3 Cherrywood
Chineham Business Park
Basingstoke
Hants RG24 8WF

DINAMAP™ *Compact* Vital Signs Monitor Model TS

TABLE OF CONTENTS

1 INTRODUCTION 7

1.1 Scope of Manual 7

1.2 Warranty and Service 7
1.2.1 Packing Instructions 8
1.2.2 Service Loan Units 8
1.2.3 Repair Parts 8
1.2.4 Replacement Accessories 9

1.3 Service Centers 9

1.4 Installation and Operation 10

1.5 Warnings & Precautions 10

1.6 Symbol Definitions 10
1.6.1 Safety Symbols 10
1.6.2 Key and Display Symbols 10
1.6.3 Connector Symbols 11

1.7 Electrical, Mechanical & Environmental Specifications 11

2 PRODUCT DESCRIPTION 15

2.1 Introduction 15

2.2 Physical Description 15

2.3 Overall Principles of Operation 19

2.4 Functional Description 19
2.4.1 System Processor 19
2.4.2 Temperature System (TS & T models only) 20
2.4.3 NIBP System 21
2.4.4 Pneumatics System 21
2.4.5 SpO_2 System (TS & S models only) 23
2.4.6 Power Supply 23
2.4.7 Audio Amplifier 24
2.4.8 Alarm and Communication Interfaces 24
2.4.9 User Controls 25
2.4.10 Displays 25
2.4.11 Printer 26

3 MAINTENANCE 27

3.1 General Maintenance 27
3.1.1 Replacing Fuses 27
3.1.2 Periodic Maintenance 27
3.1.3 Care of the Storage Battery 28

3.2 Service Modes **29**
3.2.1 The Clinician Menu (Service mode **1 2 3 4**) 31
3.2.2 The Service Menu (Service mode **2 2 1 3**) 32

3.3 Calibration - Checking & Re-calibrating **36**
3.3.1 Checking of NIBP Calibration 36
3.3.2 NIBP Calibration 37
3.3.3 NIBP Pop Off Checking 38
3.3.4 NIBP Pop Off Pressure Calibration 39
3.3.5 Predictive Temperature Calibration Check 40
3.3.6 Predictive Temperature Calibration 40

3.4 Monitor Disassembly **42**
3.4.1 Removal of the Front Panel 42
3.4.2 Removal of the Switch board, Display board and Liquid Crystal Display module 44
3.4.3 Removal of the Chassis 46
3.4.4 Removal of the Main Board and Power Supply board from the chassis 47
3.4.5 Removal of the Pump and Pressure Transducer 48
3.4.6 Removal of the Printer 49
3.4.7 Reassembling the Monitor 50

4 MANUAL RELEASE TEST PROCEDURE **51**

4.1 General **51**
4.1.1 Test Equipment 51
4.1.2 Test Conditions 51
4.1.3 Service mode 51

4.2 Test Procedure **52**
4.2.1 Power Up Tests 52
4.2.2 External DC Supply and Battery Indication Operation 52
4.2.3 Temperature Requirements 52
4.2.4 Pulse Oximeter Requirements 53
4.2.5 NIBP Requirements 54
4.2.6 Printer Operation 55
4.2.7 Calibration Time Stamp 55

4.3 Manual Release Test Results Sheets **56**

5 TROUBLE SHOOTING. **58**

6 TECHNICAL INFORMATION **64**

6.1 Host Port Connector (rear panel) **64**

6.2 Remote Alarm Connector (rear panel) **64**

6.3 Accessory Part Numbers **65**

6.4 DINAMAP™ *Compact* Service Spares List **69**

6.5 Procedural & Error Alarm Code Table **75**

7 GLOSSARY OF TERMS AND ABBREVIATIONS 77

8 SERVICE DIAGRAMS 78

1 Introduction

1.1 Scope of Manual

This Service Manual provides service and parts repair information for the DINAMAP™ *Compact* Vital Signs Monitor.

This manual is intended for use by service technicians who are familiar with electromechanical devices and digital and analog circuit techniques.

WARNING

To reduce the risk of electric shock, do not remove the instrument's covers.
Refer servicing to qualified service personnel.
Only trained service technicians should perform repairs on this equipment.
Take particular care when servicing the power supply assembly.

For information about operating the monitor in a clinical environment, refer to the DINAMAP™ *Compact* Vital Signs Monitor Operation Manual (p/n 776-980.)

1.2 Warranty and Service

The warranty for the product is enclosed with the product in the shipping carton. All repairs on products under warranty must be performed by or approved by Technical Service personnel. *Unauthorized repairs will void the warranty.* Qualified electronic service personnel should repair products not covered by warranty.

Extended warranties may be purchased for most products. Contact your sales representative for details and pricing.

If the product fails to operate correctly, or if assistance, or service is required, contact the Technical Support Department at Critikon. Before doing so, it is helpful to attempt to duplicate the problem and to confirm the correct operation of all the accessories to ensure that they are not the cause of the problem.

Prior to calling, please be prepared to provide:

- the product name and model number
- a complete description of the problem

and if repair parts or service are necessary:

- the product serial number
- your business name and address, and Critikon Company account number
- a purchase order number if parts or service are to be purchased
- the part number of the required spare parts

If your monitor requires warranty, extended warranty, or non-warranty service, call Technical Support and a representative will assist you. To expedite service where the product has external chassis or case mechanical damage, please advise the Technical Service representative when you call.

The representative will record all the necessary details and will provide the information, which is required for all returned products.

Prior to returning the monitor, contact GE Medical Systems *Information Technologies:*

1-877-274-8456

This service is available Monday to Friday between the hours of 8 am and 7 pm EST excluding holidays.

1.2.1 Packing Instructions

- Remove all hoses, sensors, power cables and the battery from the monitor.
- Only pack the accessories, which you are requested to return, and pack these in a separate bag within the same carton as the monitor.
- Use the original shipping carton and packing materials, if available.
- Place the monitor in a plastic bag and tie or tape it shut to prevent loose particles entering the product.
- Pack 4 to 6 inches of padding around all sides of the monitor.
- Use packing tape to securely close the carton.

Insurance is at the customer's discretion. Any claims for damage must be initiated by the sender.

1.2.2 Service Loan Units

A loan unit is provided on request, at no charge during the service life of the product, while Critikon is performing the repair. The loaner equipment will be shipped to your site within 2 business days.

- Critikon will pay for shipping the loaner unit to the customer during warranty repairs.
- The customer must pay shipping charges when a loaner unit is issued for a non-warranty repair.
- The customer must pay shipping charges when a loaner unit is returned.

All loaner units must be returned within the time specified otherwise a rental fee may be incurred.

1.2.3 Repair Parts

Repair parts can be ordered from Customer Care via telephone or fax. Complete assemblies such as the power supply board are available on an exchange basis. Contact Technical Support for details.

Fax: 813-887-2403

Please allow one working day for confirmation of faxed orders. All such orders must contain the following information:

- Your business name, address and telephone number
- Your fax number
- Your purchase order number
- Your account number.

1.2.4 Replacement Accessories

Replacements such as hoses and sensors must be purchased from GE Medical Systems.

Tel: (877) 274-8456

Please have your account number and the reorder / product code available for the item you wish to order.

A table of accessories and replacement part numbers appears in section **6.3**.

1.3 Service Centers

For service, repairs or parts information, contact either the following Critikon office or your local Critikon Sales Representative

North America

GE Medical Systems *Information Technologies*
4502 Woodland Blvd
Tampa, FL, 33614
877-274-8456

1.4 Installation and Operation

For information on the installation and/or operation of the DINAMAP™ *Compact* Vital Signs Monitor, reference must be made to the DINAMAP™ *Compact* Vital Signs Monitor Operation Manual. This instrument is to be operated and serviced by authorized personnel only, and only in accordance with the Warnings and Precautions given in both the DINAMAP™ *Compact* Vital Signs Monitor Operation Manual and this document.

1.5 Warnings & Precautions

Refer to the safety warnings and precautions detailed in the DINAMAP™ *Compact* Vital Signs Monitor Operation Manual.

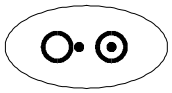
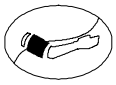
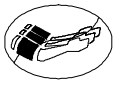
This manual is intended for use by authorized personnel who are familiar with digital and analog electronic principles and who are also familiar with the operation of the DINAMAP™ *Compact* Vital Signs Monitor. Disconnect all the power sources before removing covers.

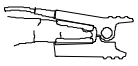
1.6 Symbol Definitions

1.6.1 Safety Symbols

	ATTENTION: Read accompanying documents
	Equipment complies with IEC601-1 (1988) Type B.F. Defibrillator protected.

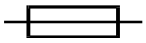
1.6.2 Key and Display Symbols

	Power Off/On
	Silence Alarms
	NIBP
	STAT
MAP mmHg	MAP

	SpO_2 *
	Predictive Temperature **
	Battery Power
	External Power
 BPM	Beats Per Minute

* = TS & S models only
** = TS & T models only

1.6.3 Connector Symbols

	External Alarm Connector
	External Comms Port Connector
	Fuse
	External Power

1.7 Electrical, Mechanical & Environmental Specifications

NIBP

CUFF PRESSURE RANGE: Adult / Pediatric: 0 mmHg to 290 mmHg
Neonate: 0 mmHg to 140 mmHg

DEFAULT TARGET CUFF INFLATION: Adult / Pediatric: 178 ± 15 mmHg
Neonate: 110 ± 15 mmHg

TARGET CUFF INFLATION ADJUSTMENT RANGE: Adult / Pediatric: 100 to 250 mmHg; 5 mmHg increments
Neonate: 100 to 140 mmHg; 5 mmHg increments

BLOOD PRESSURE MEASUREMENT RANGE:	**Systolic mmHg**	**MAP mmHg**	**Diastolic mmHg**
Adult / Pediatric:	30 - 245	15 - 215	10 - 195
Neonate:	40 - 140	30 - 115	20 - 100

BLOOD PRESSURE ACCURACY: Meets AAMI/ANSI SP-10 Electronic or Automated Sphygmomanometer Standard for Accuracy. (AAMI/ANSI standard :± 5 mmHg mean error; 8 mmHg standard deviation; intra-arterial method.)

BLOOD PRESSURE DETERMINATION TIME: 20 seconds to 45 seconds typical
Adult: 120 seconds maximum,
Neonate: 85 seconds maximum.

PULSE RATE DETERMINATION: Adult / Pediatric: 30 - 200 BPM
Neonate: 30 - 200 BPM

PULSE RATE ACCURACY: ± 3.5 percent

OVERPRESSURE CUT-OFF: Adult / Pediatric 300 - 330 mmHg
Neonate 150 - 165 mmHg

Predictive Temperature Determination (TS & T models)

RANGE: Max. 42.2 ?Celsius 108.0° Fahrenheit
Min 31.1?Celsius 88.0° Fahrenheit

PROBE ACCURACY: ? 0.1°C ± 0.2°F

PREDICTIVE TEMPERATURE ACCURACY :	? 0.6°C, 36.1 - 39.4 °C ± 1°F, 97 - 103 °F UNSPECIFIED < 36.1°C, > 39.4 °C UNSPECIFIED < 97 °F, > 103 °F
DETERMINATION TIME:	30 seconds typical; 60 seconds maximum

SpO_2 (TS & S Model)

OXYGEN SATURATION

RANGE:	0 to 100%
SATURATION ACCURACY:	0% to 69%: unspecified

ADULT ACCURACY (70-100%)

Nellcor Puritan Bennett™ Sensor	Accuracy
OXICLIQ-P Pediatric sensor	2.5 digits
OXIBAND Pediatric/infant sensor	3.0 digits
DURA-Y ear clip	3.5 digits
OXISENSOR II D-20 Pediatric sensor	3.5 digits
OXICLIQ-N neonatal/adult sensor	2.5 digits
REFLECTANCE sensor	3.5 digits
DURASENSOR adult	3.0 digits
OXIBAND adult/neonatal sensor	3.0 digits
DURA-Y multisite sensor	3.0 digits
OXISENSOR R-15 adult nasal sensor	3.5 digits
OXISENSOR II D-25 adult sensor	2.0 digits
OXICLIQ-A adult sensor	2.5 digits
OXISENSOR II N-25 neonatal/adult sensor	2.0 digits
OXISENSOR II I-20 infant sensor	2.0 digits
OXISENSOR II D-25L adult sensor, long cable	2.0 digits

Neonatal Accuracy:

When sensors are used on neonatal subjects as recommended, the specified accuracy range is increased by ?1 digit to account for the theoretical effect on oximeter measurements of fetal hemoglobin in neonatal blood (e.g., N –25 accuracy on neonates is ?3, rather than ?2.)

Note: Refer to NELLCOR PURITAN BENNETT sensor specifications.

PULSE RATE DETERMINATION:	20 BPM - 250 BPM +/- 3 beats
SATURATION PITCH INDICATOR:	Pitch changes with saturation. Volume selectable from 0 (off) to 9.
WAVEFORMS:	Pulse Plethysmograph waveform on LCD gain compensated
SENSOR DISCONNECT / DISCONNECT FROM PATIENT:	The monitor will detect the attachment or disconnection of a sensor from the patient within 5 seconds.
PULSE DETECTION:	The monitor will detect a pulse or enter a no signal state within 15 seconds of being attached to the patient.

LOSS OF PULSE: The monitor will detect loss of pulse from patient and enter a no signal state within 10 seconds.

Mechanical

DIMENSIONS:

Height:	9.1 in (23.0 cm)
Width:	7.3 in (18.5 cm)
Depth:	6.9 in (17.5 cm)

WEIGHT including battery: 8.3 lb (3.75 kg)

MOUNTINGS: Self-supporting on rubber feet or pole mountable.

PORTABILITY: Carried by recessed handle or pole mounted.

CLASSIFICATION INFORMATION:
- Mode of Operation - Continuous
- Degree of Protection against harmful ingress of water: (See IPX1 definition).

Power Requirements:

POWER CONVERTER: Protection against electrical shock - Class 1

INPUT VOLTAGE: 115 / 230 VAC, 50 / 60 Hz (nominal),
90 ~ 264 VAC, 47 ~ 63 Hz (range)

MONITOR: Protection against electrical shock - Class 1

INPUT VOLTAGE: 24 VDC (nominal), 12-30 VDC from supplied power converter

EXTERNAL DC LINE FUSE: T3.15A 250 VAC

BATTERY: 12 volt, 2.3 amp-hours.
Minimum operation time: 2 hours (5 minute auto cycle with adult cuff at 25°C with power save mode enabled) from full charge. Time for full recharge: 8 hours from full discharge

Environmental

OPERATING TEMPERATURE: + 5° C to + 40° C (+ 41° F to + 104° F)

OPERATING ATMOSPHERIC PRESSURE RANGE: 700 to 1060 hectoPascal

STORAGE TEMPERATURE: –20° C to + 50° C (– 4° F to + 122° F)

STORAGE / TRANSPORTATION ATMOSPHERIC PRESSURE: 500 to 1060 hectoPascal

HUMIDITY RANGE: 0 % to 95 % non-condensing

RADIO FREQUENCY Complies with IEC Publication 801-3 (Draft 7, second edition)

ELECTROMAGNETIC IMMUNITY: 3.0V/m, modulation 80% AM @ 1kHz, frequency range 26.0~1000.0Mhz

CE 0086

This product conforms with the essential requirements of the Medical Device Directive. Accessories without the CE Mark are not guaranteed to meet the Essential requirements of the Medical Device Directive.

IPX1

The DINAMAP™ Compact monitor is protected against vertically falling drops of water and conforms to the IEC 529 standard at level of IPX1. No harmful effects will come of vertically falling drops of water making contact with the monitor.

2 PRODUCT DESCRIPTION

2.1 Introduction

The DINAMAP™ *Compact* series of monitors are portable devices, provide non-invasive determination systolic and diastolic blood pressure, mean arterial pressure (MAP), pulse rate, predictive temperature and blood oxygen saturation for neonatal and adult/Pediatric patients. Certain model variants are not equipped with all functions. The monitors are mains or battery operated, and are primarily intended for use in hospital acute care settings such as Day Surgery, Accident & Emergency, ITU, High Dependency Units, Labor and Delivery, GI/Endoscopy, and Medical/Surgical Units.

2.2 Physical Description

Each monitor is supplied with an accessory pack. The contents of the pack vary according to model and are listed below:

Model: **DINAMAP™ Compact BP Monitor**

Qty	Description
1	DINAMAP™ *Compact* Monitor with integral printer
1	AC-DC Power Converter
2	Mains power leads
1	Rechargeable Battery
1	Cuff, Standard Adult
1	Pneumatic Hose, 12 ft., Standard Adult
2	Printer paper rolls
1	Operating Instruction Manual

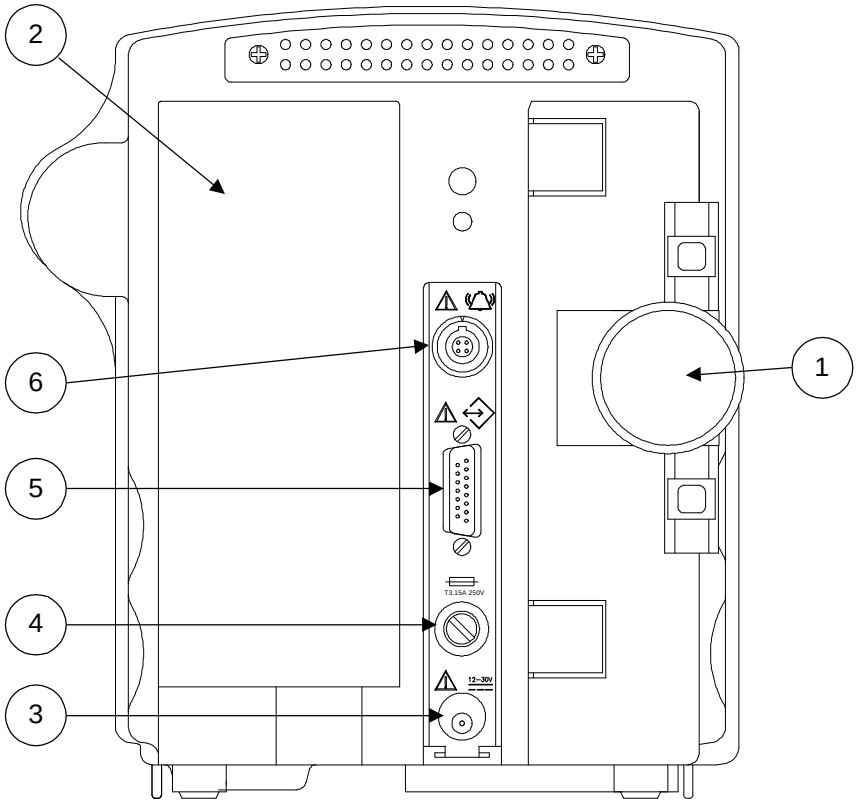
Model: **DINAMAP™ Compact TS & T Monitors** are supplied as above, with the addition of:

Qty	Description
1	Nellcor Puritan Bennett™ Finger sensor
1	Nellcor Puritan Bennett™ sensor extension cable

Models **TS and T** are supplied with the **Predictive Temperature Kit**. This is comprised of the following items:

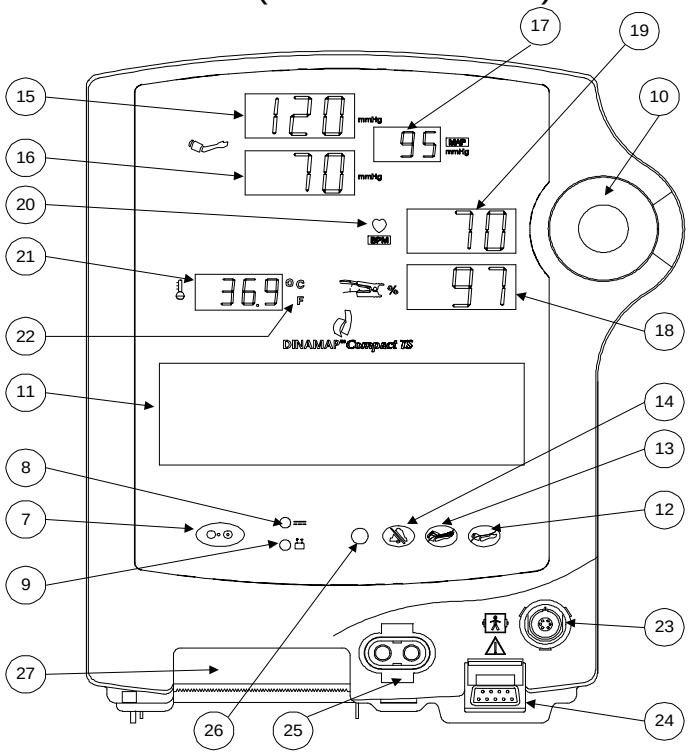
Qty	Description
1	Oral Temperature Probe
1	Probe holder accessory
2	Pack of 20 probe covers
1	Instruction sheet

Rear Panel Connections

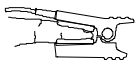


1	POLE CLAMP	Used to clamp the monitor to a pole or stand.
2	BATTERY COVER	Securely retains and protects the internal battery.
3	EXTERNAL POWER	Connection socket for the supplied external power converter ONLY.
4	FUSE HOLDER	External power source line fuse holder.
5	DATA INTERFACE CONNECTOR	Host communications port: 15 way D-type RS232 serial port for use with equipment conforming to IEC-601 only.
6	REMOTE ALARM CONNECTOR	Remote Alarm port with both normally open and normally closed isolated contacts for use with equipment conforming to IEC-601 only. (if so equipped)

Front Panel Controls & Indicators (TS Model shown)



7		This push button switch controls the ON/ OFF state of the monitor. Push for power ON and again for power OFF.
8		This green LED indicates the external power and battery charging status of the monitor.
9		This yellow LED indicates operation and charge status of the internal battery.
10	ROTOR CONTROL	This is used to highlight and select items in the LCD menus. If the monitor is OFF, pushing it will switch the monitor ON.
11	LCD	This panel displays all alarms, user interface messages & configuration options.
12		Press this key to begin or halt an NIBP determination. The key also cancels STAT mode.
13		Press this key to begin or halt operation of the STAT mode of NIBP monitoring.
14		This switch alternately mutes & enables the audio alarm. When pressed once (SILENCE ON) the switch lights indicating audible alarms have been silenced.
15	SYSTOLIC PRESSURE	This 3 digit red LED display indicates the measured systolic B.P. in mmHg.
16	DIASTOLIC PRESSURE	This 3 digit red LED display indicates the measured diastolic B.P. in mmHg.

18		This 3 digit LED indicates SpO_2 Oxygen Saturation in %. =
19	PULSE BPM DISPLAY	This 3-digit yellow LED display shows pulse rate in Beats Per Minute.
20		This yellow LED flashes, indicating real-time pulse rate measurements are derived from the SpO_2 signals.
21		This 4 digit red LED Display indicates the measured Temperature.
22	°C °F DISPLAY	These indicate that Temperature is being displayed in degrees Celsius or Fahrenheit.
23	TEMP. PROBE CONNECTOR	Plug the predictive temperature probe cable into this socket.
24	SpO_2 SENSOR CONNECTOR	Attach the SpO_2 sensor extension cable to this socket. =
25	CUFF CONNECTOR	Insert the NIBP Cuff hose into this connector.
26	LIGHT SENSOR	Automatically measures ambient light to set LED display intensity.
27	PRINTER DOOR	Open this door to gain access to the paper.

17	MAP mmHg	This red LED display indicates the measured mean arterial B.P. in mmHg. It also shows instantaneous cuff pressure during an NIBP determination.	**= TS & S models only**

2.3 Overall Principles of Operation

This section of the manual describes the principles of operation of the DINAMAP™ *Compact* monitor. The section is arranged to give an overall description of the instrument, the following sections then detail each of the functional systems. For full assembly drawings, circuit diagrams and parts lists of the component circuit boards, refer to section **8** of this manual. The system block diagram of the DINAMAP™ *Compact* monitor is shown in drawing 8600EB.

Patient vital signs can be measured by a variety of electronic sensors, including oscillatory pressure sensors for Non-Invasive Blood Pressure measurement. Both the DINAMAP™ *Compact* T and TS models are provided with a predictive temperature parameter determination. The *Compact* TS model is also equipped with a Nellcor Puritan Bennett™ Blood Oximetry module enabling oxygen saturation and heart rate to be determined from information received via a finger sensor.

Operator access is via buttons and the rotor located on the front panel. A liquid crystal graphics display module provides the user with menu, alarm and status information as well as a plethysmograph display or a record of previous measurements. Parameter information is presented by multiplexed seven segment LED displays and discrete LED indicators. A thermal printer provides hard copies of patients vital signs either automatically or on demand. A built-in speaker and piezo-electric sounder advise the user of pulse signals and alarm conditions.

The monitor is designed to operate from AC mains via the supplied power converter, or from an internal rechargeable battery. The external AC power converter rectifies the mains to produce a raw DC supply which is regulated internally to provide the DC operating power. The external raw DC source is employed to charge the internal batteries. The real time clock and user monitor settings are maintained by an internal rechargeable NiCd backup battery.

The monitor includes a pneumatics system required for NIBP operation. NIBP determinations are made by pumping up the air pressure in a restrictive cuff and monitoring the oscillatory signals in the system as the pressure is released. Large deflation steps are employed for NIBP and the system processor interpolates measurements between steps. The pneumatic system then regulates operation of the pneumatic pump and valves. An overpressure sensor provides independent protection against over-inflation. Protection against deflation failure is inherent in the design; the valve and pneumatic system being designed to auto-deflate the system in the event of power fail or alarm situations.

Blood Oximetry (SpO_2) determinations (model TS only) are made using a proprietary module from Nellcor Puritan Bennett™, which communicates the parameter measurements to the system processor via an internal serial port.

Predictive temperature measurements are based on a 3 or 12-minute mercury in glass reference. Predictive Temperature probes can be connected to the monitor to provide an analog signal representing the measured temperature. An A/D converter then digitizes this analog signal; this information is then interpreted by the system processor and displayed for viewing.

2.4 Functional Description

The functions of the DINAMAP™ *Compact* monitor can be separated into eleven discrete parts. The following paragraphs describe each of the Monitors, with full circuit diagrams provided in section **8**.

2.4.1 System Processor

The system processor is based on 68302 microprocessor IC22 on the Main Board. A master 19.6608 MHz clock generated by XL1 exits the system processor at pin 98 and is divided by 16 inside binary ripple

counter IC36 to provide the 1.23 MHz ADC clock. Communication between microprocessor IC22 and all bus devices is provided by a 24-bit address bus, 8-bits data bus and the three wire serial peripheral interface (SPI) bus. The system processor is equipped with a watchdog timer and reset circuit.

The system program is stored in a 4 Mbit FLASH memory IC28 as 512k by 8 bit words. Program memory is provided by a low power 1 Mbit SRAM IC32 formatted as 128k by 8 bit words. Non-volatile settings are stored in an EEPROM IC26 which talks to a dedicated serial port on the system processor. All bus devices are powered from the +5VD digital supply, except for the RAM that is also powered from the VRAM supply when the system is in “standby” mode.

Should the software detect a system fault or fail to reset its watchdog timer, the system processor will output a logic low level on its watchdog output WDOG. This is latched as FAILSAFE by the output of the bistable formed by IC31, allowing the output of the relaxation oscillator IC1 to pass through IC4 to sound the piezo sounder LS1. The FAILSAFE signal is also used to disable the isolated power supply module PM100.

The power supply board battery backup voltage BATT_BACKUP, derived from either NiCd battery or an external supply, appears on the supervisory circuit IC35. This supervisory circuit has two functions. First, it generates Reset and Halt signals for the system processor when the 5 volt power supply powers on and off respectively. Secondly, it controls transistor TR8, allowing the 5 volt line to power the RAM chip IC32 and PIC when the system is “on”, or the BATT_BACKUP to power the RAM and the PIC when the system is “off”. This allows values to be saved in the otherwise volatile RAM and to maintain the low power standby mode of the PIC.

Additional control signals from the system processor are decoded by IC16, which generates seven chip select lines and IC17 which generates latch outputs for the LED display drivers. The data bus D0 ~ D7 is filtered by inductors L12~19 to produce a buffered data bus DB0 ~ DB7 for the display drivers.

There is also a PIC micro-controller IC5 on the power supply board 8620AB, which has its own independent watchdog, reset circuit and provides the real-time clock function. The PIC provides control of PSU status, battery charging, printer and alarm/annunciator audio output. Communications between the system processor and the PIC are continually monitored in order to provide additional fail-safe security for the monitor. All measurement, alarm and communications ports of the instrument are isolated to IEC601.

2.4.2 Temperature System

The temperature system for the Model DINAMAP™ *Compact* Monitor for reading predictive thermistor probes is located on the Main Board.

If a thermistor probe is used, the resistance of the probe varies in relation to temperature. The probe resistance is effectively in parallel with R63 and therefore a change in temperature results in a change in voltage applied to input selector IC19. The selected input voltage from IC19 is connected to the voltage to frequency converter (VFC) IC18. The frequency of the square wave output from the VFC varies proportionately to the input voltage. The output signal is isolated through opto-coupler PC2 and enters the system processor, as PRED_TEMP_F. The processor receives the square wave signal and determines the temperature by counting the number of edges received per unit interval.

Through the application of a software algorithm, the system processor provides two select lines TEMP_SEL0 and TEMP_SEL1. These are isolated by opto-isolators PC3 and PC4 and used to control the input selector IC19, allowing the appropriate resistor tree to be selected. There are four selectable channels, two providing calibrations points, a third used for probe type detection and the fourth for the thermistor measurement.

The probe type is determined by measurement of the frequency produced by the VFC from a DC input derived from resistor tree R59-R61; for an oral probe this produces a frequency equivalent to 42 degrees Celsius, Rectal probes short out R61 and hence change the frequency slightly. The software is capable of determining which probe type is attached and hence selects the appropriate measurement mode.

Compensation for drift in accuracy of the system is achieved by the unit recalibrating itself on switch on and after each measurement and at ten-minute intervals. Calibration is achieved by measuring two points on the high precision resistor chain of RV3, R70, and R74-77 which equate to 10°C and 37°C. Any changes in VREFI or voltage to frequency transfer characteristic can therefore be accommodated within reason.

The temperature circuit is powered from an isolated 5-volt and ?9 volt supply (5 and ?15V on revision 04 and earlier), these supplies are generated by the isolated power supply module PM100. Calibration of the voltage and hence frequency in the temperature reference circuit is achieved by the use of resistor trees, attached to a stable reference voltage. This reference, VREFI is 3.24 volts (nominal) and is generated from the isolated 5-volt line by D2, adjustment provided by RV2. Thus RV2 will adjust the overall calibration of voltage ranges X0, X1 and X2. Additional adjustment of the calibration points X0 and X1 is provided by RV3 in their resistor tree. Together RV2 and RV3 are used to calibrate the temperature circuit.

The VREFI may be measured across TP3 and TP2, and the PRED_TEMP_F signal may be measured across TP9 and TP6.

2.4.3 NIBP System

The non-invasive blood pressure system measures blood pressure and pulse rate. The NIBP measurement circuitry is located on the Main Board.

To measure blood pressure, a reference voltage generated by IC2 supplies a bridge pressure transducer ML1 to enable it to convert air pressure from the pneumatics system into an analog voltage. The instrumentation amplifier IC5 amplifies this voltage. The unfiltered signal PT1 is routed to into an eight channel analog multiplexer, IC20. When selected, the output signal is buffered by IC21 as signal BUF_ANA_MUX and enters the ADC IC23. The digitized output of the ADC is presented to IC24, an octal buffer/line driver, from where it is transmitted to the data bus and the system processor. Pressure transducer offset PT1_REF from the output of IC2 also enters the analog multiplexer IC20. When selected, it provides an off-set value to the system processor. The processor then measures the offset value and subtracts the offset from PT1 measurements. The control signals for the multiplexer (ASEL0 ~ ASEL2) are generated by the system processor.

The pulse rate component (typically one percent) of the cuff pressure signal is filtered and separated from the PT1 pressure signal. The low pass filter formed around IC9a allows the low frequency pulse signal through whilst attenuating any higher frequency noise. The signal is then ac coupled by the high pass filter of C20 & R41 in order to strip off the small pulse rate signal from the cuff pressure signal. IC9b then amplifies the pulse signal before being applied to high pass filter IC12. The output from IC12 FPT1 is routed to the analog multiplexer IC20 for selection by the system processor. The system processor controls the analog switch IC7, it is used to clamp and apply offset signals into the filtered pressure measurement channel.

The system software includes an internal on-line self-test feature for the FPT channel at power-up and after each non-STAT mode determination.

2.4.4 Pneumatics System

The pneumatics system provides air pressure for the NIBP cuff, manifolding for control of cuff pressure, and an overpressure signal to the system processor and pneumatic control logic GAL if the pressure exceeds 300 mmHg in adult mode or 158 mmHg in neonate mode. The system is comprised of an air pump, pressure transducer, overpressure detection circuitry, power control circuit, and two solenoid-operated pneumatic valves. Air from the pump is routed through the dump valve to the cuff output manifold.

The pneumatics system provides control of the pump by commands received from the system processor. The PUMP_ON signal from latch IC3 on the Main Board is passed to the pneumatic control logic GAL IC1 on the power supply board. The GAL produces a pump drive signal which turns on FET TR4b, TR13 and TR8, pulling down the ground return side of the pump motor through current sensing resistor R31. Both the

Deflate and Dump valve control signals are also generated by latch IC3 (Main Board) and passed to the GAL IC1 (power supply board). Pump motor current is sensed in R31 and amplified by IC4. This is routed to the system processor as PUMPC and also compared to a reference to produce an over current input signal to the GAL. If pin 9 of GAL IC1 goes high, pin 12 (signal LATCHED_OVC) will be latched high and the pump enable output will go high switching off the pump. The latched over current condition can be reset by the Main Board processor asserting PNEURESET high.

The Deflate valve vents the system to atmosphere in its energized state. When the pump is operating, the deflate valve is de-energized by the GAL IC1 turning off FET TR1b in the ground return side of the valve circuit. If a failsafe, overpressure or deflate condition signal arrives on the GAL, the valve will be energized and the system will rapidly deflate. The over-pressure signal is produced by the pump pressure transducer and associated electronics, while the failsafe can be derived from the system processor's watchdog output as well as from the PIC IC5.

Conversely, the Dump valve vents the system to atmosphere in its de-energized state. When the pump is operating during a determination cycle, the Dump valve remains energized, the GAL receiving a high level DUMP signal from the latch IC3 on the Main Board. When the determination cycle is complete, or if an alarm condition arises, the DUMP signal from latch IC3 will go low causing the GAL to turn off FET TR4a and de-energize the dump valve, opening the system to atmosphere.

Because the action of deflation can be initiated by energizing one valve or de-energizing another, a power failure during a determination will always result in de-pressurization of the system.

The action of operating the Dump and Deflate valves produces a voltage across R20/21 and R66. This signal is labeled VALVESENSE and is routed to the multiplexer IC20 on the Main Board from where it can be selected by the system processor. The four possible conditions of the Dump and Deflate valves can be ascertained from the VALVESENSE signal.

Once the system processor has determined which cuff type is being used, it instructs latch IC3 to output an ADULT signal to TR1. In the pump pressure transducer circuit on the Main Board, IC8 generates a high precision 5 volt reference, which is made available to dual op-amps IC10 and IC21. This reference is monitored by the system processor as PT2_REF. The buffered reference from IC21 is applied to excite the pump output pressure transducer ML2 on the Main Board (Transducer mounted on Pump assembly on revision 04 and earlier). The output of the transducer varies in proportion to the air pressure in the system. The transducer ML2 output pins connect to IC11, an instrumentation op-amp in differential mode configuration. An offset voltage derived from the voltage reference IC8 is buffered by IC10b and fed to IC11 it is then summed with the amplified difference signal from the transducer. IC11's output is passed to the analog multiplexer IC20 as PT2 and the inverting input of comparator IC15a where it is compared to the over pressure limit.

Note: For revision 04 units and earlier the reference to IC25 on the Main Board in the following paragraphs relates to IC10.

The system processor produces control signals POT_INC, POT_U/D and POT_CS to drive a digital potentiometer IC13 which sets the gain of amplifier IC25a and hence the over pressure limit. The "high" end of the digital pot is connected to the output of the output of IC25a while the "low" end of the pot connects to the precision resistor chain formed by R47, 48, & 50. The "wiper" of the pot connects to the inverting input of IC25a. During factory set-up, the over pressure alignment is trimmed by selecting IC13 and incrementing its output up or down. After alignment is complete, jumper LK1 is removed, thus preventing chip select of the digital pot.

The output of IC25b applies an offset to the Adult/Neonate threshold input of IC15a. The output of IC15a, labeled UNFIL_OVP, is normally at a high logic level but changes to low when overpressure occurs. This signal is available as an input to the PSU board as unfiltered overpressure (UNFIL_OVP). UNFIL_OVP is then filtered by R49 and C27 and fed in to comparator IC15b to produce filtered overpressure signal FLT_OVP and is made available to the PSU board. The overpressure threshold voltage reference is

buffered by IC12 to produce TH_VREF which can be measured by the system processor via multiplexer IC20 and ADC IC23.

Upon clearance of the overpressure condition the Main Board system processor can reset the overpressure latch in GAL IC1 on the PSU Board, by asserting PNEU_RESET signal high, in order that another determination can be carried out.

2.4.5 SpO_2 System (TS & S models only)

Blood oxygen saturation and pulse determinations can be made (DINAMAP™ *Compact* TS and S only) using a Nellcor Puritan Bennett™ finger sensor. This connects to the SpO_2 module fitted inside a shielded case mounted in the monitor. This module is supplied as a complete replaceable part, no service being possible.

The SpO_2 module communicates with the system processor via an isolated two wire serial interface. Data signals from the system processor (SPO2_TX) are isolated by opto-coupler PC6. From here they enter connector PL13 to the SpO_2 module. Likewise, data transmitted from the SpO_2 module are isolated by opto-coupler PC5, from where it is routed to the system processor as signal SPO2_RXD.

The SpO_2 module (and the temperature determination circuit) is powered via an isolated power supply module PM100. This is powered from the +12VV supply and generates the isolated +5VI, +9VI and -9VI supplies (+5VI, +15VI and -15VI supplies on revision 04 units and earlier). On revision 06 units the isolated power supply module is switched on by the system processor SPO2_PSU_ON signal, turning TR11 off and setting the control input to ML3 high. On revision 04 and earlier units the isolated power supply module ML3 is turned on by grounding its -ve supply connection through FET TR12. In the event of a FAILSAFE condition arising, the control signal of ML3 is set low by TR10 switching on (06 unit), or by switching TR12 off (on revision 04 units and earlier).

2.4.6 Power Supply

The power supplies are generated and controlled on the power supply board.

The power supply is designed to operate from both an external DC line source and from a 12-volt rechargeable lead-acid battery. The supplied mains power converter provides 24 volt DC output. When both supplies are present, the power supply will operate from the line supply if it is greater than 12 volts. If the line supply is greater than 16 volts the battery will be charged both when the monitor is switched on and off. The power supply sequencing functions are controlled by the PIC IC5.

Incoming line power from the external power converter has any high voltage spikes snubbed by transient suppresser D4 and over-voltage protection is provided by D6, R10 and CSR1. Should the line input voltage rise above 34 volts, zener diode D6 conducts, turning on thyristor CSR1. This causes a short circuit which blows the external DC line fuse. Reverse polarity protection for the power supply is provided by blocking diodes D8 and D29. A sample of the line input voltage is taken by R3 and R6 (DC_INPUT), and routed to the external DC detection circuit IC16 and the PIC.

The switcher IC3, inductor L1 and diode D10 form a flyback converter with a nominal output of 15.1 volts and VRAW of 14.8 volts through the battery blocking diode D11. A sample of the smoothed output is taken by R29 & R30 to provide a feedback voltage.

The PIC uses the DC_BATTERY, DC_INPUT and EXT_DC_ON signals to determine the available power sources. If valid power supply conditions exist and a battery is detected, the PIC will turn on TR7, which turns on p-channel FET TR6, allowing the +15VI line to charge the battery via D9, R17 and FS1. When charging is taking place, a voltage will appear across R17, which will be proportional to the charge current. This voltage is sampled by R14 & R15 to produce the BATTERY_C signal.

If there is no valid external DC line supply applied to the monitor, the monitor will default to use the battery. DC from the rechargeable battery arrives on thermal fuse FS1, from where it is routed to the source of TR2, a p-channel FET under the control of TR3. The battery supplies power to VRAW via transistor TR2 and diode D28. When operating from a battery, VRAW will be in the range 10.4 - 13.5 V depending on the battery charge. A sample of the battery's terminal voltage is taken by R1 & R2 and applied to the ADC input of the PIC (DC_BATTERY). From this, the PIC can determine the charge state of the battery.

Diodes D24 and D25 provide a power supply line VDC_OP which is present whenever a supply is available. This supply is used exclusively for IC16, a programmable voltage regulator with internal comparator. IC16 performs two functions. First, its internal comparator compares the sampled line input voltage DC_INPUT to an internal reference level. When the DC_INPUT is below approximately 10.4 volts, IC16 turns off TR14 to indicate to the PIC that there is no valid external DC input. The second function of IC16 is to generate a precision voltage supply from VDC_OP, set by R5 & R9 to 4.5 volts. This voltage is connected to the BATT_BACKUP line by D13, D23 preventing the voltage from entering the NiCd backup battery. This battery, B1, has a nominal terminal voltage of 3.6 volts and is trickle charged form the +15.1 volt supply when the system is powered.
The VRAW supply, which is nominally 14.8 volts when operating from an external line voltage or 10.4 to 13.6 volts when operating from battery, is used to generate the other power supply lines. The monitor's power on switch is routed directly to the PIC, which controls the set up sequencing of the power rails. The PIC switches on the +5VD line then the +VDISP line, the 12-volt supplies are controlled by the system processor which turns them on after the +5VD supply is stable.

VRAW enters IC7, a step down DC-to-DC converter, which is used to produce the +5VD digital line. The 5 volt logic supply IC7 is controlled by the PSU_INH signal from the PIC. VRAW also connects to IC17 to produce the +4.5 volt LED display supply +VDISP, which is controlled by the PIC signal ENABLE_VDISP.

The 12 volt line and other supplies are controlled by the 12V_ON signal from the system processor on the Main Board. When this pin is at a high logic level, TR9 is turned on, as is p-channel FET TR10. This causes the VRAW supply to enter IC8, a boost-switching regulator. R41 & R42 set the output voltage of the flyback converter to 14.5 volts, which is further regulated by linear regulator IC9 to produce the pump and valve supply +12VV line and linear regulator IC18 to produce the analog supply +12VR line. The output of TR10 also feeds the inverting switching regulator IC10, which produces a -14 volt supply to linear regulator IC19 that in turn produces the analog supply -12VR line. A sample of the +12VV line is taken by R44 & R45, producing the PUMP_V signal, while a sample is taken across +12VR and -12VR lines by R47 & R48 producing the ANALOG_V signal. These are measured by ADCs inside the PIC to confirm the operation of the power supplies.

2.4.7 Audio Amplifier

User warning sounds are generated by the power supply board PIC as a pulse width modulated digital signal AUDIO_FREQ. This signal is fed to all the inputs of the quad bilateral switch IC14, their outputs being connected together via a resistor ladder to produce a switched gain-summing amplifier IC6. The gain elements are operated by the PIC signal A_GAIN0-3, together providing a 4-bit (16 level) volume control. The output of the summing amplifier IC6 also applies band-pass filtering to the audio signal. The circuit around IC6b sets the upper breakpoint of the filter, while the circuit on the input to the final amplifier IC15 sets the lower breakpoint and provides amplification for the speaker.

2.4.8 Alarm and Communication Interfaces

The remote alarm signal originates from the system processor on the Main Board, from where it is logic ORed with the FAILSAFE signal, inverted and sent as the REMOTE_ALARM signal to the power supply board. The signal controls n-channel FET TR11 to drive the coil of the relay RL1/2. The switch side of the relay contains both normally open and normally closed contacts, which are separated from the monitor electronics via an isolation barrier. A dual pole dual throw relay is used, but its switch elements are connected in parallel to provide a single pole dual throw action with increased current capacity.

Communications signals use the RS232 bi-directional serial format. Digital TTL level signals from the system processor are converted to RS232 level signals on the power supply board by IC13, which generates the necessary positive and negative voltage swings. In addition, inverted TTL data transmit and receive lines are provided. A 5-volt supply is also made available to the serial port, this being protected by a 0.1 amp thermal resetable fuse.

2.4.9 User Controls

The user controls are comprised of four push buttons; power, stat, NIBP start/stop and alarm silence, and the rotor control. When the rotor control is turned, it operates an optical encoder producing a Gray code output. Pressing the rotor operates a push button switch. These rotor control signals and the four push buttons are encoded together on the switch board by a register latch IC2. The register is periodically polled by the system processor to determine if any of the switches have been operated. IC2 is controlled by the chip select signal KEY_CS and the read signal LD_RD. KEY_CS is produced by the Main Board chip select decoder IC16 under control of the system processor, while LD_RD comes from the processor.

The ambient light detection circuit comprises of the light dependant resistor LDR1 and a bias resistor in a potential divider configuration. A change in the level of incident light on the LDR1 causes its resistance to alters, changing the voltage applied to the PIC ADC which determines the ambient light level. The system processor regularly requests the ambient light level measurements from the PIC, and in turn controls the brightness of the LED displays on the display board.

2.4.10 Displays

All displays, except for line power indicator, are multiplexed, and are split into three separate control circuits, each with its own display driver. The power / charging green LED is controlled by the PIC software.

The three LED display drivers (IC1, 2 & 3 on the display board) are Maxim MAX7219's, which are controlled by the system processor via the SPI bus. The LED parameter displays are divided into functional groups on the display board. IC1 drives the systolic and diastolic displays; IC2, the Temperature and MAP displays; IC3, the Heart Rate and SpO_2 displays as well as the battery, °C, °F and Heart Rate discrete indicators. A current limiting resistor attached to iSET input of each driver IC sets the maximum segment current in the display; each current limiting resistor is different because each driver IC controls different sized LEDs. IC3 drives red and amber seven segment displays as well as red and amber discrete displays, additional low value resistors or links R1 to R11 are inserted in series with the anode of each diode to provide different LED currents within the same multiplex group.

The display drivers are all controlled by the system processor via the SPI bus data signal SPTXD. This transmits the display data and controls the brightness of the displays by varying the multiplexer's PWM ratio. Data is latched into each driver ICs when the respective load signal LED_LOAD0-2 is pulled high by decoder IC17 on the Main Board. This is synchronized with the LED SPI clock signal LED_CLK from the system processor.

Text and graphical data is displayed on the LCD graphics module, which contains its own on-board driver electronics. The module is controlled by the system processor via filtered data bus DB0 ~ DB7, address signal A4, RESET and the LCD_CS, LD_WE and LD_RD lines. The LCD_CS line is produced by the Main Board chip select decoder IC16, while the LD_WE and LD_RD lines are derived from the system processor's R/W and CS and logic ICs IC1 & IC27.

Backlight illumination of the LCD is provided, the green LED source being under software control via the system processor. The BACKLIGHT signal is decoded on the Main Board and used to turn on an N-channel FET TR1 on the display board. A resistor sets the current and hence the constant backlight brightness.

The LCD module requires the +5VD and -VLCD supplies to function. The -VLCD supply is derived from the -12VR supply and can be trimmed by potentiometer RV1 on the switchboard. This adjusts the effective

viewing angle or contrast of the LCD display. The trimmed voltage is nominally set to -9.6V and may be measured across TP1 and TP2 of the switchboard.

2.4.11 Printer

The monitor employs an Axiohm HPT4050 thermal printer module, fitted to the printer board, which contains the interface electronics. The PIC provides stepper motor control signals M_OE, M_PHASE1 and M_PHASE2 to IC3 on the printer board. This converts these to sequential drive signals MP1_1, MP1_2, MP2_1 and MP2_2 for the stepper motor.

The PIC also sends a PRINTER_TRIGGER signal to initiate printer action; this triggers a timer IC4 which generates the printer enable signal PRINTER_OE. To optimize print speed, print quality and the life of the print head, a thermistor constantly measures the temperature of the head. As the system heats up, the print head thermistor is used by the timer circuit to reduce the width of the PRINTER_OE pulse. The print head voltage +VP is also employed to alter the width of the PRINTER_OE pulse. A typical print trigger pulse width is 6 ms. An opto-transistor detects the presence of printer paper and a micro switch detects the status of the printer door, open or closed. These two devices are combined to produce the PRINTER_READY signal, which inhibits the printer action when clear and is sent back to the PIC as PRINTER_BUSY. Data for printing is sent from the system processor to the printer board via the SPI bus.

Because the instantaneous power demand of the printer is quite high, a dedicated 6.1-volt supply +VP is generated from VRAW by IC1 and extra reservoir capacity is provided by C16 and C17.

3 Maintenance

This section of the manual contains four parts:

- The first covers general maintenance functions, which can be performed without disassembly of the monitor.
- The second covers use of the built-in Service Software.
- The third describes how to calibrate the NIBP and overpressure detection of the monitor, or check their calibration.
- The fourth describes maintenance, which requires removal of the monitor's covers, disassembly of the components and internal alignments.

Procedures that pertain to SpO_2, the printer and temperature components apply only to suitably equipped DINAMAP™ *Compact* Vital Signs Monitors.

3.1 General Maintenance

3.1.1 Replacing Fuses

The Monitor contains three fuses:

- Replaceable fuse protecting the external line input
- Thermal auto resetting fuse protecting the battery input
- Thermal auto resetting fuse protecting the 5V output on the Host Communications Port

UK models will also be protected by a fuse fitted in the mains plug of the power converter input cable.

To replace the External Line Fuse, first remove the line power cord from the rear of the Monitor, if connected. Insert a flat bladed screwdriver or small coin into the slot in the fuse holder cap and carefully rotate anti-clockwise several revolutions. The fuse-holder cap and fuse will be released.

Pull the fuse from the cap and inspect it for a burned or broken filament. If the filament appears to be intact, check the fuse for continuity with an ohmmeter. If damaged, replace with a fuse of the specified rating and type.

To reassemble, push the fuse into the cap and insert both into the holder. With the flat bladed screwdriver or small coin, rotate the cap clockwise until it is flush with the holder. Do not over tighten. Apply the external line power and confirm that the monitor operates correctly.

3.1.2 Periodic Maintenance

Periodic maintenance tasks include cleaning the Monitor, checking pressure calibration, checking for pneumatic leaks, checking the overpressure cut-out, and checking the temperature calibration where fitted.

Cleaning the Monitor

The exterior of the Monitor may be wiped clean with a cloth slightly dampened with mild detergents or normal hospital bactericides.

- Do ***not*** immerse unit.
- Do ***not*** clean with isopropyl alcohol or other solvents.

- The adult DURA-CUF™ range supplied for use with this Monitor may be cleaned by hand washing in warm soapy water. Care should be exercised, however, to ensure that no water enters the cuff or cuff hoses at any time. In the event water accidentally enters the cuff, passing air through the cuff will dry it.
- The neonatal cuffs are supplied for single use and should be discarded if they become soiled.
- Do ***not*** immerse hoses.
- Do ***not*** immerse cuffs without prior application of cuff hose caps.

CAUTION

- Moisture or foreign substances introduced into the pneumatic system can cause damage to the unit. Calibration equipment should always be kept dry and free of particulate matter.
- The probe holder may be removed and cleaned with a mild detergent. The probe holder may be immersed during cleaning.
- Do ***not*** immerse temperature calibration plug.
- The probe may be cleaned with an alcohol solution. Use a cloth or sponge, just damp, ***not*** wet, and avoid getting any liquid into the interior of the probe.

Checking of Calibrations

Refer to section **3.3** for instruction on the procedures required to check each of the parameter calibrations.

3.1.3 Care of the Storage Battery

It is best to keep the battery charged as fully as is practical and never store the monitor with the battery in a discharged condition. When the battery will no longer hold a charge, remove and replace with one of the same part number.

To charge the battery, connect the supplied power converter to the monitor's rear panel, then plug the converter's mains lead into an appropriate AC receptacle. The battery will charge regardless of the position of any other monitor switches.

A battery that is completely discharged can be fully recharged by the monitor within eight hours. Charging will take place with the monitor switched on or off, as long as it remains connected to an external AC power source via the supplied power converter.

The expected lifetime of the battery largely depends on the way in which the instrument is used. If the battery is allowed to completely discharge before being fully recharged, the battery should survive around two hundred recharge cycles. If the battery is used in such a way that it never becomes more than one third discharged and is fully recharged whenever possible, it can survive up to twelve hundred cycles. This means that by thoughtful usage, the lifetime of the battery can be extended up to six times.

PRECAUTIONS

- To ensure that the battery will be ready for portable operation, keep the unit connected to a mains supply whenever possible.

- Repeated failure to fully charge the battery will result in a significant reduction in battery life.

Avoid storing batteries at temperatures above 77° F (25° C). High storage temperatures can dramatically increase the rate of self-discharge of the battery.

3.2 Service Modes

There are three different service modes, each offering different levels of access to the monitor's set-up and calibration. These modes can be accessed using the rotor control and display panel. The modes are:

1. The "Clinician Menu" mode, allowing:
   - ?? setting of temperature units,
   - ?? checking NIBP and temperature calibration dates,
   - ?? setting the alarms into "Permanent Silence" mode.

   (This mode is described in the DINAMAP™ *Compact* Monitor Operating Manual).

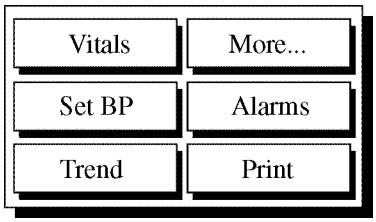
2. The "Main Service Mode" provides the features allowed from the clinician menu (described above) plus the following:
   - ?? Checking NIBP calibration,
   - ?? NIBP re-calibration,
   - ?? Pop Off (overpressure detection) calibration,
   - ?? Changing temperature algorithm,
   - ?? Set temperature calibration date,
   - ?? Configuration for use with Central Station,
   - ?? Changing language of operation,
   - ?? Monitor "Set-up" - specifying whether SpO_2, printer, and temperature are fitted.

3. The "Super Service Mode" is used to allow the calibration of the Predictive Temperature circuitry and Neonatal Overpressure checking procedure. Other menu options within this mode are for manufacturing test purposes only.

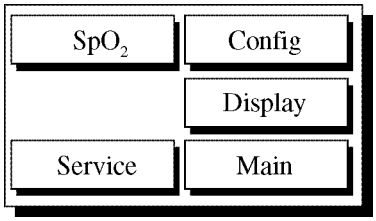
Note : Certain menu functions may not be present or appearance may be slightly different than depicted in the following section if unit is fitted with software earlier than 8613-V4.1.

To enter the service mode from the Main Menu, use the rotor control and LCD.

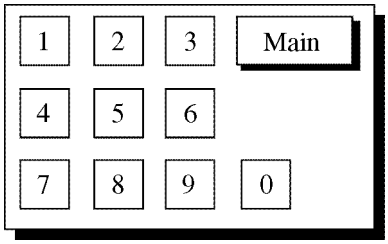
First select **More…**



then **Service**



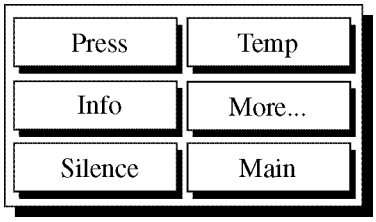
then sequentially enter the access code for the required Service mode.



The code choices are: **1 2 3 4**..... for access to the Clinician Menu.

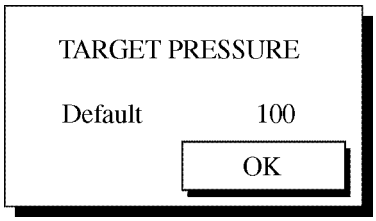
2 2 1 3..... for access to the Main Service Menu.

3.2.1 The Clinician Menu (Service mode 1 2 3 4)



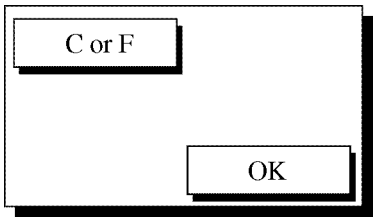
3.2.1.1 Press

Sets default target pressure for first NIBP cycle.



3.2.1.2 Temp

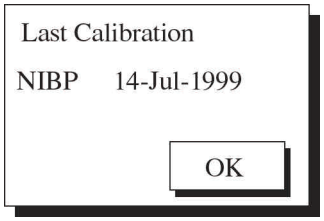
Selection of this button allows the temperature units of the monitor to be toggled between degrees Celsius and degrees Fahrenheit.



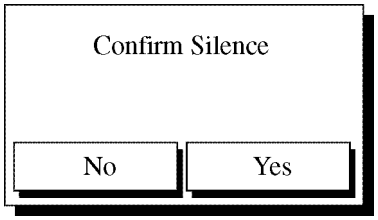
When Celsius is selected, the °C indicator lights. When Fahrenheit is selected, the °F indicator lights. Click on **OK** to clear and save the selection. Note that changing temperature units will clear the trend readings. The user is requested to confirm or cancel this.

3.2.1.3 Info

Selection of this button causes the most recent calibration dates of the NIBP and Temperature (not displayed) systems to be displayed. Click on **OK** to clear the menu.



3.2.1.4 Silence



Selection of this button will cause **all** alarms other than failsafe to be muted until either the monitor is powered off and on again, or the Alarm Silence button is pressed.

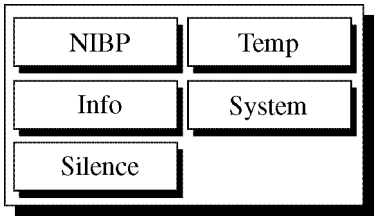
A confirmation menu will appear on the display. Selection of either **Yes** or **No** will exit the menu.

If silence is confirmed, the monitor's Alarm Silence button illuminates.

3.2.1.5 Main

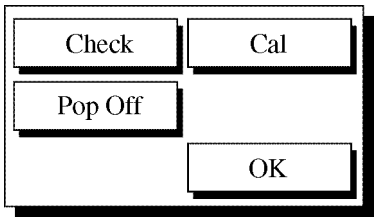
Selection of this button exits the user service menu and returns to the Main Menu.

3.2.2 The Service Menu (Service mode 2 2 1 3)



3.2.2.1 NIBP

Selection of this button causes the NIBP service menu to appear. This menu is used for calibrating, and checking the calibration of, both the NIBP transducers and the over pressure (Pop Off) circuitry.



Check

Selection of this button allows the NIBP calibration of the monitor to be checked. In this mode, the monitor functions as a digital pressure gauge, the systolic and diastolic displays showing the current pressure as measured by PT1 (main pressure transducer) and PT2 (pressure transducer on pneumatic assembly) respectively. With no hose attached, both displays should indicate "000". See section **3.3.1** for a more detailed description of using this mode.

Cal

Selection of this button initiates the calibration procedure. See section **3.4.1** for a more detailed description of using this mode.

Pop Off

Selection of this button initiates the Pop Off test. See section **3.4.3** for a more detailed description of using this mode.

OK

Selection of this button returns the display to the Service Menu.

3.2.2.2 Temp

Selection of this button causes the Temperature service menu to appear.

C or F

Selection of this button allows the temperature measurement units to be toggled between Celsius and Fahrenheit. A warning will appear to inform the user that this change will result in the loss of any existing trend information.

Cal

Selection of this button causes the current date to be saved for the Info display. This should only be done when the temperature calibration has been set as described in section **3.3.6**.

3 Mins

Selection of this button sets the temperature mode to “3 minute predictive” i.e. the results obtained are those which would be obtained by a mercury-in-glass thermometer after 3 minutes.

12 Mins

Selection of this button sets the temperature mode to “12 minute predictive” i.e. the results obtained are those which would be obtained by a mercury-in-glass thermometer after 12 minutes.

OK

Selection of this button returns the display to the Service Menu.

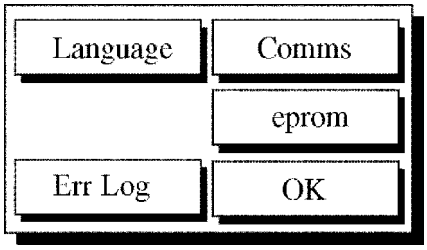
3.2.2.3 Info

Selection of this button displays the last calibration date information for both the NIBP and Temperature systems.

Selection of **OK** returns the display to the Service Menu.

3.2.2.4 System

Selection of this button causes the System service menu to appear.



Error Log

When selected will produce a printout of the system errors that have occurred on unit. The Main Board and PSU board software revision is printed out.

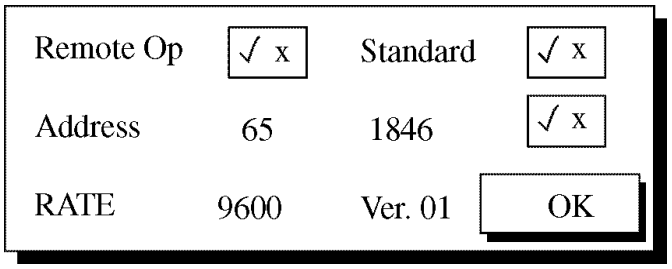
Language

Selection of this button allows the display language to be pre-set.

Selection of any language button removes all other language buttons from the screen, indicating that the remaining button is the chosen language.
Selection of **Clear** will restore all language buttons, allowing the user to select again.
Selection of **OK** saves the setting to the chosen language. If no language was selected when **OK** was pressed the language will be stored as undefined. The monitor will then prompt the user to select a language on every power up until a successful selection has occurred.

Comms

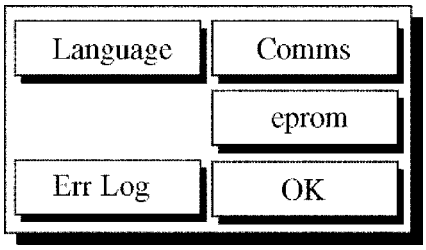
Selection of this button causes the Communications menu to appear.



Selection of the **Remote Operation** check box toggles remote operation on and off. When on, a tick appears next to the box, denoting that remote operation (i.e. from the central station) is possible.
Selection of the **Address** box allows the monitor's address to be set within the range 1 to 255.
Selection of **OK** returns to the Service Menu.

System

Selection of this button causes the hardware System menu to appear.



Selection of any of the check boxes causes that monitor feature to be toggled on or off. When on, a tick appears next to the box, denoting that the option is available. Monitors without certain features are supplied without the necessary hardware for that feature and thus will have that option unselected. Selection of **OK** saves changes and returns to the Service menu.

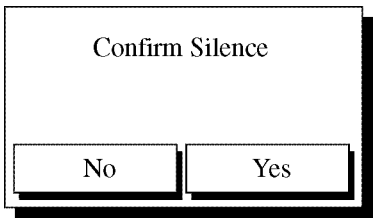
OK

Selection of this button returns the display to the Service Menu.

3.2.2.5 Silence

Selection of this button will cause all patient alarms to be muted until either the monitor is powered off and on again, or the Alarm Silence button is pressed.

A confirmation menu will appear on the display. Selection of either **Yes** or **No** will exit the menu.



If silence is confirmed, the monitor's Alarm Silence button illuminates.

3.3 Calibration - Checking & Re-calibrating

This section details the following procedures:

- Checking NIBP calibration
- Recalibrating NIBP
- Checking NIBP overpressure detection (Pop Off)
- Re-calibrating NIBP overpressure detection
- Predictive temperature calibration checking
- Re-calibration of predictive temperature

3.3.1 Checking of NIBP Calibration

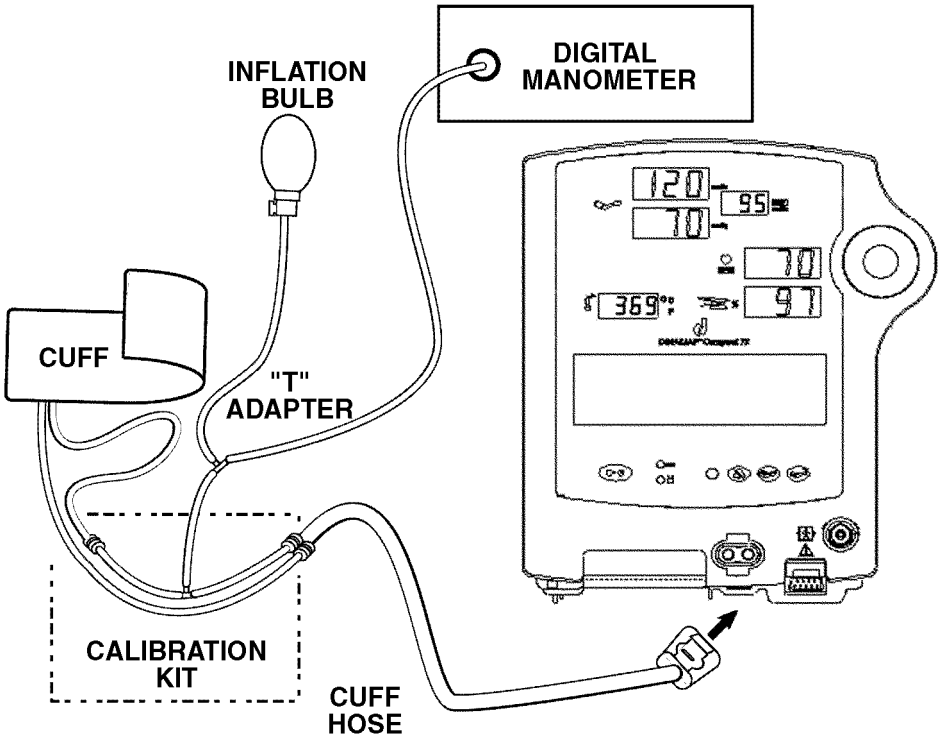
The following section describes how to verify the NIBP calibration on a DINAMAP™ *Compact* Vital Signs Monitor. Refer also to the next section for details on re-calibration of a DINAMAP™ *Compact*.

Checking of NIBP calibration is possible without disassembling the DINAMAP™ *Compact*.

I. Set up the DINAMAP™ *Compact* and calibration equipment as shown on page 38.
II. Switch on the DINAMAP™ *Compact* and allow 10 seconds to settle.
III. Verify that the calibration pressure measurement system reads 0 mmHg (0 mBar)
IV. If the DINAMAP™ *Compact* displays the language choice menu, choose “English”, then “OK”. Reboot the DINAMAP™ *Compact* by turning monitor off, and then back on.
V. Select the “Mode” button from the main menu. The Mode menu will be displayed
VI. Select the “Service” button from the mode menu
VII. Enter the Service Mode PIN code, **2 2 1 3**. The Service menu will be displayed.
VIII. Select “NIBP” from the service menu. The NIBP Service menu will be displayed.
IX. Select “Check” from the NIBP service menu.
X. The DINAMAP™ *Compact* now displays pressures on the systolic and diastolic displays.
XI. Check calibration of the DINAMAP™ *Compact* unit is within specification at 0mmHg and 200mmHg (267mBar) applied pressure using a reference pressure measurement system.

Display	Meaning	Units	System Range
Systolic	Pressure measured at PT1 (main pressure transducer, on Main Board)	mmHg	0-300
Diastolic	Pressure measured at PT2 (on pump assembly)	mmHg	0-330† †Pop Off will occur before 330

† Normal operation of the DINAMAP™ *Compact* is not possible until powered off and back on.



DINAMAP™ COMPACT Calibration check or re-calibration

3.3.2 NIBP Calibration

The following section describes how to perform NIBP re-calibration on a DINAMAP™ *Compact* Vital Signs Monitor. Refer also to the previous section for details on checking of the DINAMAP™ *Compact* calibration.

NIBP calibration is possible without disassembling the DINAMAP™ *Compact*.

I. Set up the DINAMAP™ *Compact* and calibration equipment as shown in Section **3.3.2**.
II. Switch on the DINAMAP™ *Compact* and allow 10 seconds to settle.
III. Verify that the calibration pressure measurement system reads 0 mmHg (0 mBar)
IV. If the DINAMAP™ *Compact* displays the language choice menu, choose “English”, then “OK”. Reboot the DINAMAP™ *Compact* by turning monitor off, and then back on.
V. Select the “Mode” button from the main menu. The Mode menu will be displayed
VI. Select the “Service” button from the mode menu
VII. Enter the Service Mode PIN code, **2 2 1 3**. The Service menu will be displayed.
VIII. Select “NIBP” from the service menu. The NIBP Service menu will be displayed.
IX. Select “Cal” from the NIBP service menu.

-- Note --

From this point, the timing is critical.
It is recommended to read through
the following steps before proceeding.

X. The DINAMAP™ *Compact* requests that the pressure be set to 0 mmHg. No action should be necessary other than to verify that the calibration pressure measurement system still displays 0 mmHg (0 mBar).
XI. Approximately 6 seconds later, the DINAMAP™ *Compact* beeps and prompts for the pressure to be set to 200 mmHg. Apply 200 mmHg and maintain that pressure.
XII. Approximately 12 seconds after prompting for 200 mmHg, the DINAMAP™ *Compact* will beep 3 times, then will vent the system to atmosphere. Immediately, prior to venting, the monitor will record the measured pressure reading. This reading and the zero reading are the only points used for calibration, so it is important to ensure that the correct pressures are applied at these two points.
XIII. After venting to atmosphere, the DINAMAP™ *Compact* will display either "Calibration Complete" or "Calibration Failed".
XIV. If the calibration failed, turn off the DINAMAP™ *Compact*, check the equipment set up and repeat the process. Refer to service if calibration is still unsuccessful.

If the calibration was successful, the DINAMAP™ *Compact* will enter its "Failsafe Alarm" mode. The DINAMAP™ *Compact* has now been calibrated and can be switched off.

Check calibration of unit by repeating section **3.4.3**.

3.3.3 NIBP Pop Off Checking

The following section describes how to verify the pressure at which the DINAMAP™ *Compact* "Overpressure" detection system prevents further cuff inflation and generates an alarm.

Neonate Mode

I. Switch on the DINAMAP™ *Compact* and wait for the main menu to be displayed on the LCD.
II. Select the "Mode" button from the main menu. The Mode menu will be displayed.
III. Select the "Service" button from the mode menu. The service entry panel will be displayed.
IV. Enter the Super Service Mode PIN code, **8 3 7 8**. This will display the super service menu.
V. Select NIBP from the super service main menu.
VI. Select VSEN from sub menu followed by VAL2.
VII. Connect calibration kit to the DINAMAP™ *Compact* as shown on page 41.
VIII. Inflate system and observe the calibration pressure measurement system - the pressure will be seen to rise and, at the "Pop Off Pressure", will immediately deflate, and the pump will stop.
IX. Verify that the maximum pressure, as shown on the calibration pressure measurement system, was in the range 150-165 mmHg (200-220mBar) and that the system pressure falls to less than 20mmHg (26.6mBar) within 4 seconds.
X. Switch off unit

CAUTION

Ensure that the calibration pressure measurement system used for this test is capable of displaying pressures up to 350 mmHg safely.

Adult Mode

I. Turn on the DINAMAP™ *Compact*, and allow 10 seconds for initialization.
II. Select the "Mode" button from the main menu. The Mode menu will be displayed
III. Select the "Service" button from the mode menu
IV. Enter the Service Mode PIN code, **2 2 1 3**. The Service menu will be displayed.
V. Select "NIBP" from the service menu. The NIBP Service menu will be displayed.

VI. Select “Check” from the NIBP service menu.
VII. Inflate the system and observe the calibration pressure measurement system - the pressure will be seen to rise and, at the “Pop Off Pressure”, will immediately deflate, with the pump stopping and DINAMAP™ *Compact* reporting an “Overpressure” alarm.
VIII. Verify that the maximum pressure, as shown on the calibration pressure measurement system, was in the range 300 to 330 mmHg (400-440mBar).

3.3.4 NIBP Pop Off Pressure Calibration

This section describes how to set the Pop Off pressure - that is, the pressure at which the DINAMAP™ *Compact* hardware automatically opens the valves to atmosphere and stops the pump.

Only the “Neonatal” overpressure needs to be set; the adult pressure will be double that of the neonatal.

Calibrating the Pop Off pressure is <u>not</u> possible without disassembling the DINAMAP™ *Compact*, since a jumper (LK1) needs to be added on the Main Board to allow the adjustment. The jumper is removed after calibration during product manufacture.

I. Ensure LK1 is fitted on the Main Board
II. Set up the DINAMAP™ *Compact* and calibration equipment as shown on page 41.
III. Switch on the DINAMAP™ *Compact* and allow 10 seconds to settle.
IV. Verify that the calibration pressure measurement system reads 0 mmHg (0 mBar)
   a. If the DINAMAP™ *Compact* displays the language menu, choose “English”, then “OK”.
   b. Reboot the DINAMAP™ *Compact* by turning monitor off, then back on.
V. Select the “Mode” button from the main menu. The Mode menu will be displayed
VI. Select the “Service” button from the mode menu
VII. Enter the Service Mode PIN code, **2 2 1 3**. The Service menu will be displayed.
VIII. Select “NIBP” from the service menu. The NIBP Service menu will be displayed.

-- Note --
From this point, the timing is critical.
It is recommended to read through
the following steps before proceeding.

X. Select “Pop Off” from the NIBP service menu.
XI. Apply exactly 157.0 mmHg of pressure using the bulb pump or syringe, and hold the pressure.
XII. Approximately 12 seconds after the “Pop Off” option was selected, the monitor will bleep 3 times and then start calibration. Rigidly maintaining the pressure at this point is crucial. **IMPORTANT: The monitor requires a 157.0 mmHg pressure setting. Failure to maintain 157.0 mmHg could potentially cause an erroneous pressure reading to be stored in the EEPROM, thereby rendering the monitor inoperable.**
XIII. When calibration is complete, the monitor will enter its Failsafe alarm mode.
XIV. Turn off the DINAMAP™ *Compact*, and remove LK1.
XV. Check calibration by repeating test **3.4.3**.
XVI. Perform the Manual Release Test Procedure as per Section 5.4 prior to release of unit for clinical usage.

<u>Note</u>: If overpressure occurs when applying pressure in point (XII) above, turn off the DINAMAP™ *Compact* and re-start the sequence.

3.3.5 Predictive Temperature Calibration Check

The predictive temperature calibration of the DINAMAP™ *Compact* monitor should be checked every 12 months or when there is doubt about the validity of the temperature readings. The temperature calibration plug (part number 320-635) may be used to check the calibration of the temperature detection circuits within the monitor.

-- CAUTION --

DO NOT twist the calibration plug when inserting or removing it since this may damage the precision resistors contained within the plug.

To check the temperature calibration:

I. Insert the plug into the temperature probe connector on the front of the monitor and switch the monitor on.
II. Switch on the DINAMAP™ *Compact* and wait for the main menu to be displayed on the LCD.
III. If UUT ?C LED is lit, select MODE followed by SERVICE from the sub menu. Enter service code **2 2 1 3**.
IV. Select TEMP followed by 'C OR F' from the sub menu.
V. When LCD displays message 'Trend data will be lost', select YES and confirm ?F LED is lit.
VI. Switch unit off then on.
VII. Select the TEMP button from the main menu.
VIII. After determination, the Temperature display should show 98.6 ? 0.1 ?F.
IX. If the display is off by more than ?0.1 degrees, the monitor is out of calibration and should be calibrated.

Note: The calibration plug contains an internal resistor that must be verified every time the monitor is calibrated. Using a calibrated voltmeter, the resistance between pins 1 and 2 of the calibration plug should be 6090 ? 7 ? . If the plug is not within this range, replace it.

3.3.6 Predictive Temperature Calibration

This section describes how to enter the temperature calibration code and how to calibrate the predictive temperature circuitry. Calibration shall be conducted with an ambient temperature of 25 ?C ? 5 ?C. Calibration of the predictive temperature is not possible without disassembling the DINAMAP™ *Compact*, since adjustment of potentiometers RV2 and RV3 on the Main Board may be required.

Note: Entry to the super service menu disables all the temperature calibration error reporting.

3.3.6.1 Calibration Requirements

I. A Counter/Timer with NAMAS approved calibration with a resolution of at least 0.1?S and an accuracy of equal or greater than 0.1?S is required for set up of units with Main Board software version earlier than 8613-V4.1.
II. A temperature calibration plug (part number 320-635) is required for the procedure, check that the resistance between pins 1 and 2 of the temperature calibration plug is 6090 ? 7 ? .
III. Adjustments of calibration settings must be carried out in sequence and with no appreciable time delay between steps. This is due to the procedure being reliant on no changes occurring to the temperature of the UUT during the set up.

IV. If UUT is a T or a TS model with Main Board software revision of 8613-V4.1 or greater, proceed to the next section.

3.3.6.2 Temperature Calibration Procedure (Software Version 8613-V4.7 and subsequent)

I. Remove screws in recessed handle of the UUT and drop the front cover forward to reveal potentiometers RV2 and RV3 on the Main Board.

II. Connect AC Adapter to UUT DC input socket and switch on UUT.
III. Connect Temperature Calibration Plug to the temperature probe socket on UUT.
IV. While depressing STAT, START and Alarm Mute buttons on front panel, switch on UUT. Confirm UUT LCD is showing the Super Service Menu.
V. Select PTEMP from Super Service Menu, followed by PLUG.
VI. Adjust RV2 on UUT Main Board to obtain an edge count for the Calibration PLUG of 957.
VII. Remove calibration resistor from UUT temperature socket

Note: Test paragraphs VIII to IX must be carried out immediately after the preceding paragraph

VIII. Select 98 on the menu corresponding to the 98°F internal calibration point. Adjust RV3 until the number of edges reported for the 98 point is 948?1 edges.
IX. Select 54 on the menu corresponding to the 54°F internal calibration point. Confirm number of edges reported is 57?6 edges.
X. Turn unit off then on.
XI. Ensure that the Temperature Calibration Plug (Part No 320-635) is connected to the temperature probe socket on the UUT.
XII. If UUT is set to read temperature in °C enter service mode PIN CODE **2 2 1 3**. Select TEMP followed by °C/°F, when unit displays message ' Confirm Trend data will be lost Y/N' select YES. Switch UUT off then on and confirm **°F** LED is lit.
XIII. Select TEMP from the main menu on the UUT LCD and confirm that reading displayed after approximately 60 seconds is 98.6°F.
XIV. If reading is not 98.6°F then repeat from paragraph I.

3.3.6.3 Calibration Time Stamp

I. Enter Service Mode PIN code **2 2 1 3**.
II. From the sub menu select TEMP.
III. To record the current time and date as the time and date of calibration select CAL.
IV. Switch off UUT.
V. Switch on UUT
VI. Enter Service Mode PIN code **2 2 1 3**.
VII. Select INFO and confirm date of NIBP and time/date of TEMP calibration are correct.

Carryout Manual Release Test Procedure as per section **5.4** prior to release of unit for clinical use.

3.4 Monitor Disassembly

Most alignment and repair operations can only be performed with the monitor disassembled. This section describes how to remove the covers, disassemble the chassis and remove the circuit boards. The description refers to fully equipped DINAMAP™ *Compact* TS models. DINAMAP™ *Compact* T models do not have SpO_2 functions and therefore the SpO_2 related components are not fitted.

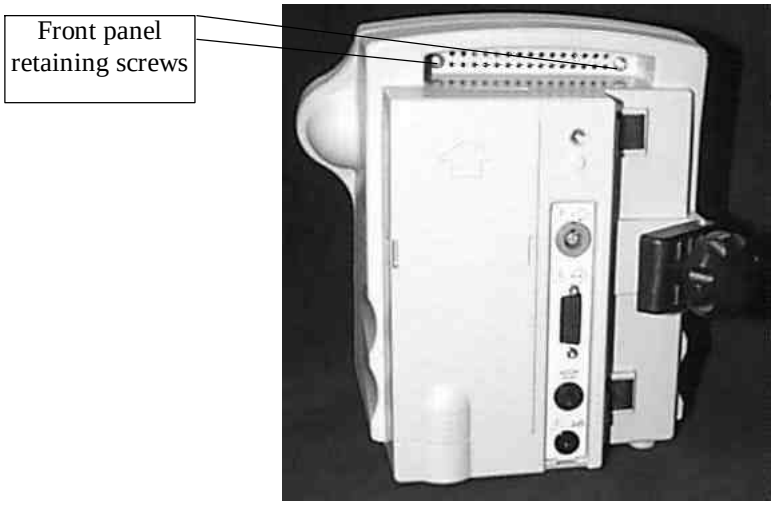
Before beginning disassembly, disconnect the line power cord from the power socket and remove the rechargeable lead-acid battery. Be careful to observe anti-static handling precautions throughout.

Note: Pictures shown are from a revision 06 unit, appearance may differ slightly on earlier units.

3.4.1 Removal of the Front Panel

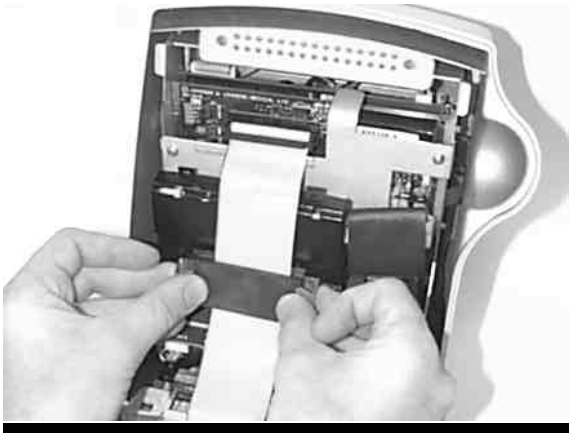
The front panel contains the Display board, Liquid Crystal Display module and switchboard. The Rotor, Temperature probe socket and SpO_2 socket (model TS) are also mounted on the inside of the panel.

The front panel must be removed if access to any of the boards or modules mounted on it or behind it is required. To remove the panel, release the two Pozidriv™ screws mounted inside the hand recess of the instrument's rear enclosure.

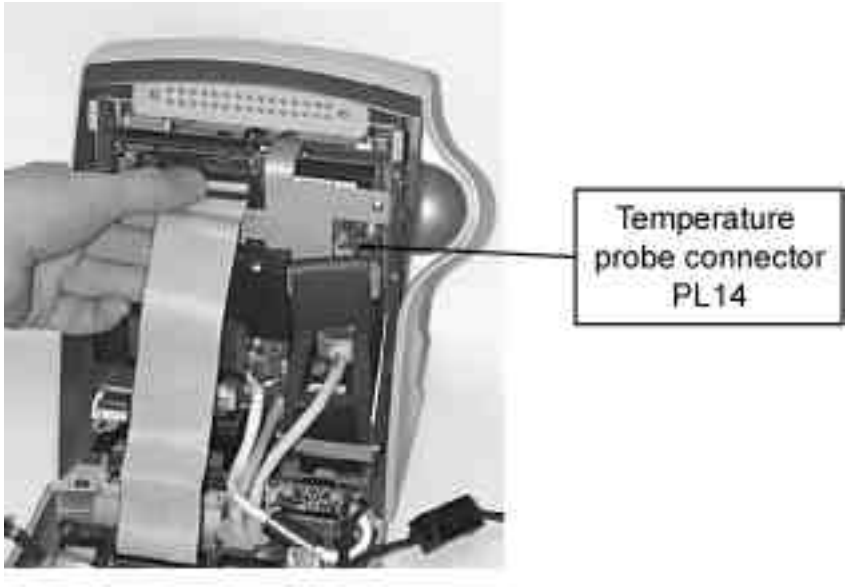


Then carefully pull the top of the front panel away from the rear enclosure. The panel will tilt forwards but is still retained by two plastic clips at its bottom edge. Unhook the front panel from these clips, taking care not to damage them. This is particularly important when refitting the front panel later.

Before the panel can be separated from the case, it is necessary to disconnect the switchboard cable, temperature probe cable and SpO_2 sensor cable if fitted.
The switchboard ribbon cable plugs into socket PL10 on the Main Board via a ferrite, which clamps the cable to the front of the chassis metalwork. Detach the ferrite from the chassis front plate by separating the Dual-Lock™ fastener.

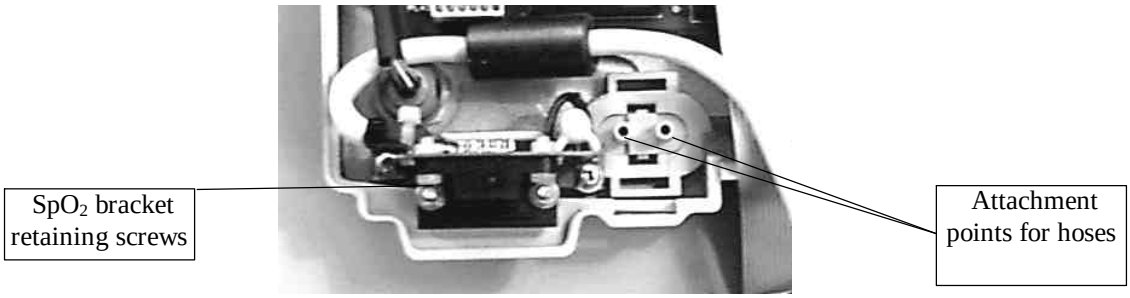


With the ferrite detached, the ribbon cable can be unplugged from socket PL10.



The cable from the Temperature probe socket plugs into connector PL14 on the Main Board and is easily removed.

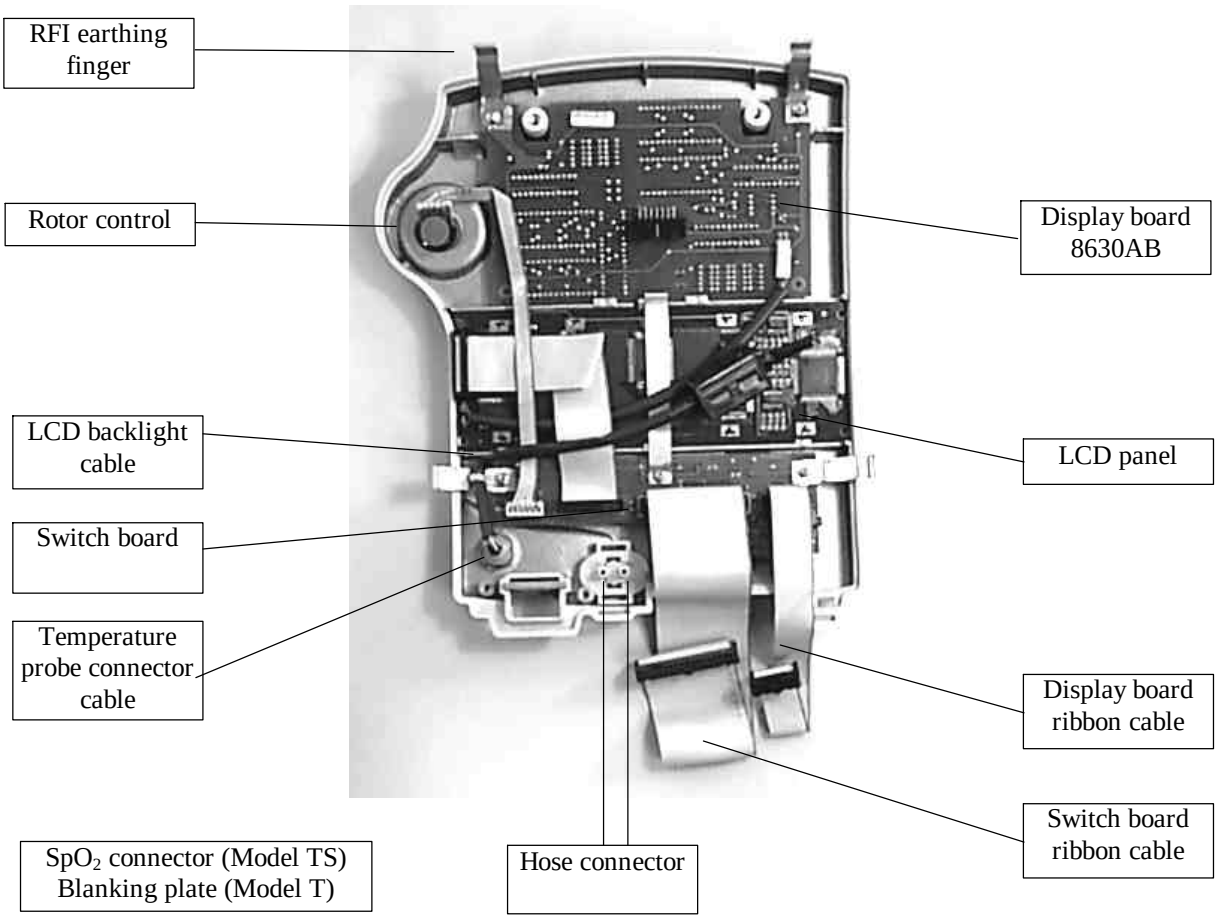
The SpO_2 cable runs from the small front panel connector printed circuit board to another small PCB with integral connector attached to the Nellcor Puritan Bennett™ module. To remove the PCB from the front panel, locate and remove the two small Pozidriv™ retaining screws, which fix the PCB metal support bracket to the front panel. The cable and PCB assembly can then be lifted away.



Finally remove the two rubber hoses, disconnect the pump hose at the pump and pressure sensor hose from the front panel, noting their routing. The front panel can now be lifted away.

3.4.2 Removal of the Switch board, Display board and Liquid Crystal Display module

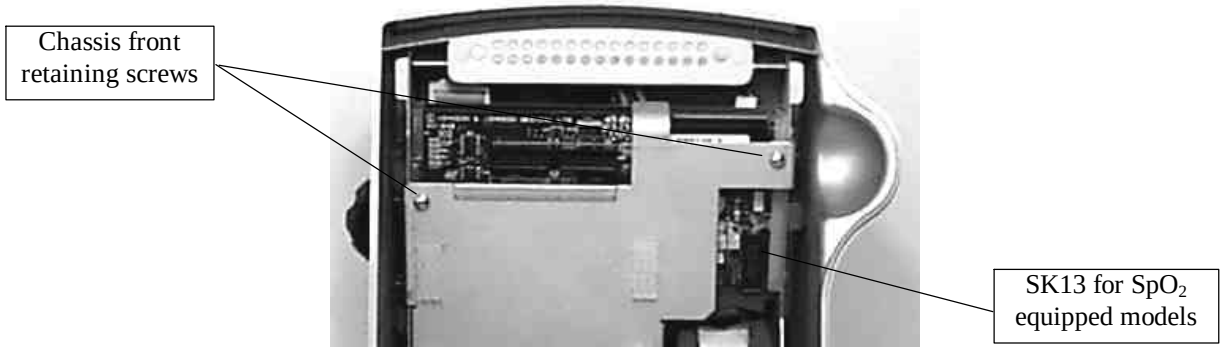
The switch board, display board and LCD module are held in place with Pozidriv™ screws which, in some cases, also hold the RFI earthing fingers in position. When removing the boards, note the orientation of the copper RFI earthing fingers so that these can be replaced in the same position later.


RFI earthing finger
Rotor control
LCD backlight cable
Switch board
Temperature probe connector cable
SpO_2 connector (Model TS)
Blanking plate (Model T)
Hose connector
Display board 8630AB
LCD panel
Display board ribbon cable
Switch board ribbon cable

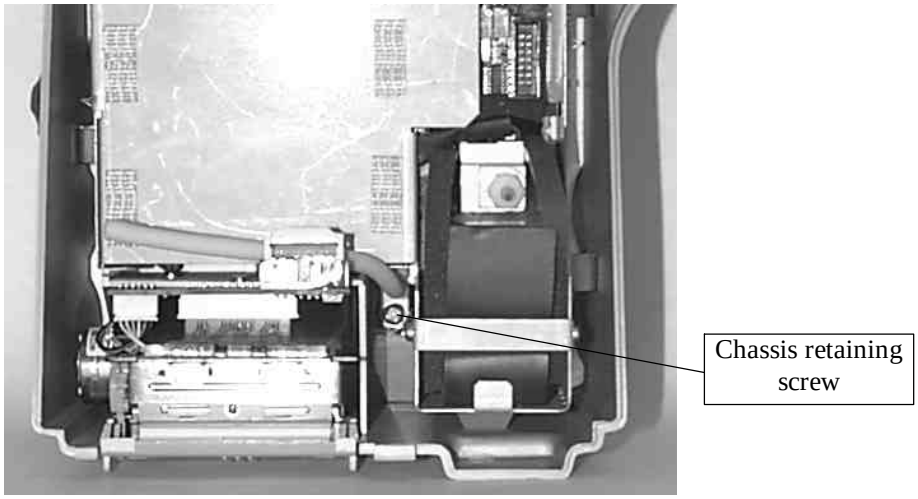
3.4.3 Removal of the Chassis

The chassis contains the Main board (revision 04 and earlier), the Power Supply board and the Pump assembly. SpO_2 equipped models also have the Nellcor Puritan Bennett™ module fitted in a shield case fixed to the front plate of the chassis. This is connected to the Main Board via the ribbon cable to SK13. Unplug this connector. Note that there are no serviceable parts inside this module.

With the front panel removed, take off the front chassis plate by removing the two small Pozidriv™ retaining screws.



Lift off the front plate complete with SpO_2 module if fitted. This will give access to the topside of the Main Board including all the test points and the Flash memory.
The remainder of the chassis can now be released from the rear enclosure by removing a single large Pozidriv™ screw located between the printer molding and the pump assembly.

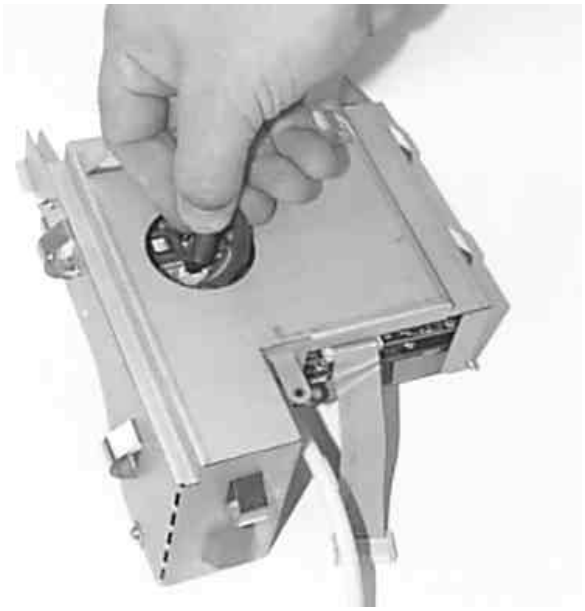


Once the screw has been removed, tilt the chassis forwards and remove the three plugs at the top of the power supply board. From left to right, these plugs connect to the host port, the power input connector and the remote alarm. Disconnect the printer cable from the Printer board. The chassis assembly may now be lifted slightly and eased forwards, so that the speaker plug can be removed from the bottom of the power supply board.

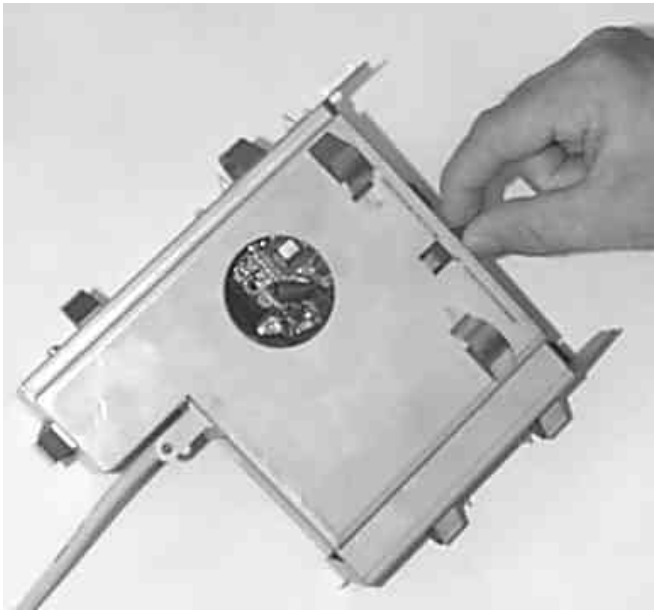
The chassis assembly may now be lifted clear of the rear enclosure.

3.4.4 Removal of the Main Board and Power Supply board from the chassis

To remove the Main and Power Supply boards from the chassis, the valve control and pump connector must first be removed. This is visible through the hole in the rear of the chassis.

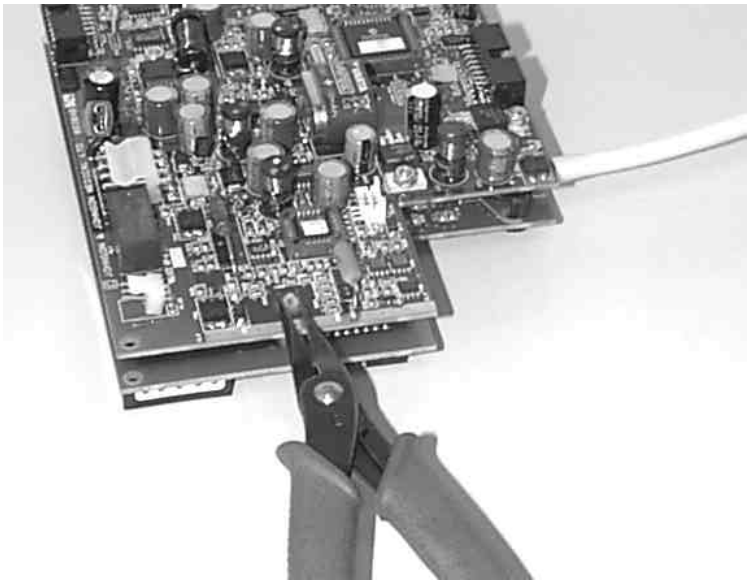


The chassis spade terminal must also be removed. This is located between the top of the chassis and the Power Supply board (Unit revision 06 only).



Disconnect pneumatic hose from pump assembly to Main Board secondary pressure transducer on revision 06 units. (Disconnect pressure sensor cable on earlier revisions)
The boards can now be slid together up and out of the pcb guides built into the metalwork of the chassis.

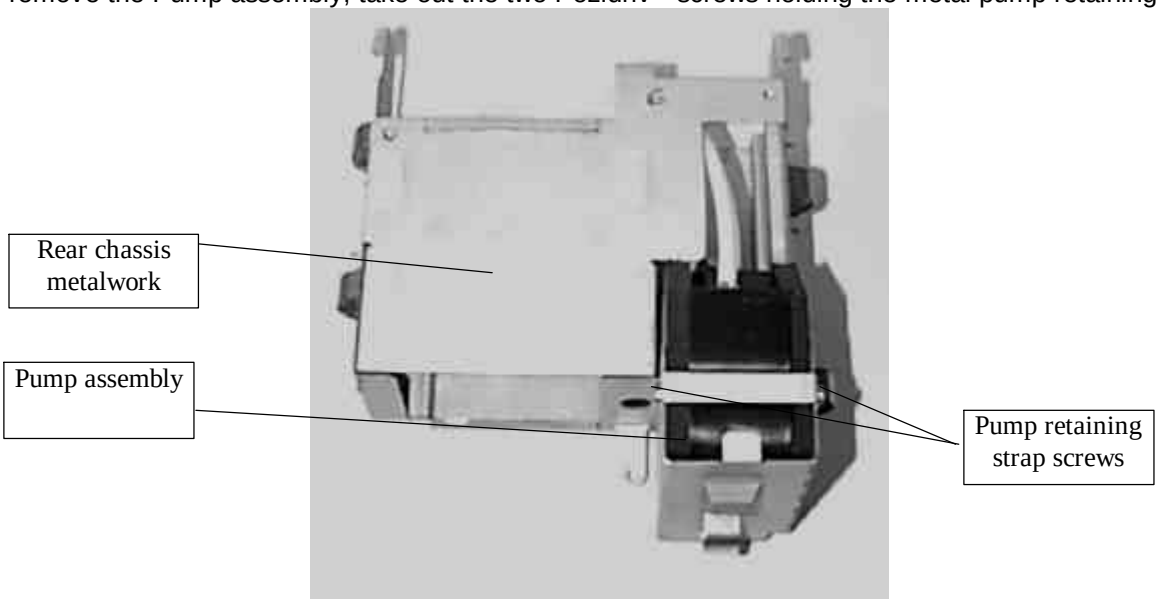
To separate the boards, use a fine nosed pliers to pinch the tip of the nylon pcb spacer while gently pulling the boards apart. Note that this will result in the loss of the user settings.



To avoid damage to the PCB interconnection, ensure that the boards are not tilted or twisted relative to each other as they are separated.

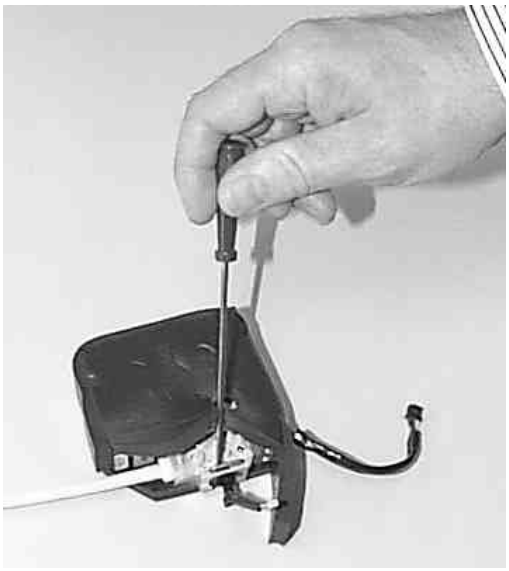
3.4.5 Removal of the Pump and Pressure Transducer

To remove the Pump assembly, take out the two Pozidriv™ screws holding the metal pump retaining strap.



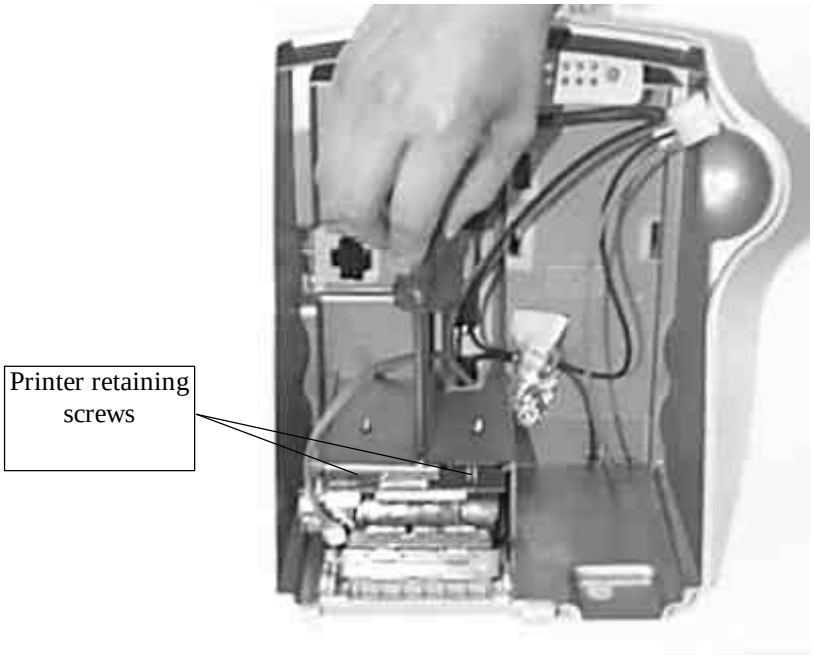
The pump assembly may now be simply removed from the chassis by tilting it forward and pulling.

To remove the pressure transducer from the pump (revision 04 and earlier units), peel back the self-adhesive foam covering the transducer.
Then use a flat bladed screwdriver to pry out the U-clip. The transducer may now be lifted away from the pump.

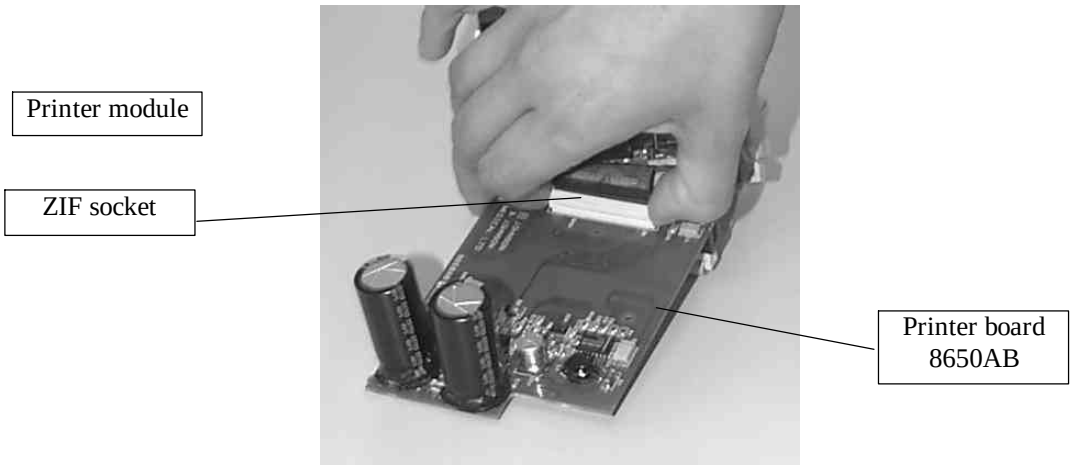


3.4.6 Removal of the Printer

The printer motor assembly and PCB are mounted upside-down inside the base of the rear enclosure. Before removing the printer, take out the paper roll if fitted and leave the printer door open. To remove the printer assembly, withdraw the three small Pozidriv™ screws. Support the printer with one hand as the screws are removed.



When removed from the enclosure, the printer's ribbon cable may be disconnected from the PCB by lifting the outer part of the plastic connector. To refit the ribbon, first lift the outer part of the connector, insert the ribbon, and then push the outer part of the connector down.



3.4.7 Reassembling the Monitor

Re-assembly is a direct reversal of disassembly, however additional care must be taken to ensure that all cables and hoses are refitted correctly. The main points to note when reassembling are:

- Pay particular attention to the wire dressing and ensure that all ferrite components are refitted correctly.
- When reassembling the chassis, remember to reconnect the valve control from the pump to the power supply board.
- When refitting the front panel, ensure that the copper earthing fingers of the front-panel engage correctly inside the rear enclosure.
- Ensure that the hoses to the front panel are not trapped or kinked while refitting the panel.
- Keep your work area clean. It is quite easy for the plastic display panel cover to become scratched if the front panel is pressed against a hard object such as a screw.
- **Be sure to re-calibrate and test the monitor as per section 3.4.1 and 3.4.6 before releasing it for clinical use.**

4 Manual Release Test Procedure

The following procedure can be used to check the primary operation of the DINAMAP™ *Compact* monitor in order to release the unit for clinical use.

4.1 General

The DINAMAP™ *Compact* unit is to be tested by applying various stimuli to the units' interfaces or measuring unit parameters. The unit test procedure utilizes functions from the operational software and also a service test mode attached to the operational software. A guide to the UUT Rear Connector and Front Panel layout can be found in section 9.

4.1.1 Test Equipment

a.) Pressure Gauge 0-375mmHg, 0.2% accuracy, Digitron P200L or similar
b.) Nellcor Puritan Bennett™ SpO_2 Simulator Model SRC-2, PT2500 or N1290 or similar
c.) NIBP calibration kit part number 320-685
d.) Temperature Calibration Plug part number 320-635

4.1.2 Test Conditions

a.) Testing shall be conducted with an ambient temperature of 25 ?C ? 5 ?C

4.1.3 Service mode

4.1.3.1 Service Mode Selection

During the test procedure the operator will be requested to enter the Service Mode.
The UUT can be switched into its Service Mode by using the following procedure.

From the main menu select MODE
From the sub menu select SERVICE.
Enter the following code **2 2 1 3**.
The UUT should then display the Service Menu.

4.1.3.2 Super Service Test Mode Selection

During the test procedure the operator will be requested to enter the Super Service Test Mode.

The UUT can be switched into its Super Service Test mode by using the following procedure:

From the main menu select MODE
From the sub menu select SERVICE.
Enter the following code **8 3 7 8**.
The UUT should then display the Super Service Test Menu.

4.2 Test Procedure

4.2.1 Power Up Tests

4.2.1.1 LED Display

Press and release the main power on switch.
Check that all LED segments are illuminated momentarily.
Press and release the main power on switch.
Ensure unit shuts down.

4.2.1.2 LCD Display

Press and release ROTOR push button.
Confirm that all the Pixels of the LCD display are lit momentarily and that a series of three long beeps followed by three short beeps can be heard.
Confirm that the display indicates the Monitor's software revision momentarily.
If the instrument is not in calibration, the LCD will display an NIBP calibration request prompt.
Press and release the main power switch.
If the UUT requires calibration refer to section **3** of the Service Manual.

4.2.2 External DC Supply and Battery Indication Operation

4.2.2.1 UUT Supply Indicator Test

Switch on UUT wait for UUT to initialize and confirm that the External DC LED is lit and the battery LED is extinguished.
Remove Battery and confirm that External DC LED on UUT Flashes.
Fit Battery and switch off External DC supply.
Confirm the External DC LED has extinguished and the Battery LED is lit.
Switch on External DC supply.

4.2.3 Temperature Requirements

Proceed to the next section if temperature circuitry has already been calibrated and checked according to section **3.4.2** and **3.4.6**

If TEMP option is unavailable on main operational menu of the UUT LCD:
Enter Service Mode as detailed in section **3.3.2.**
Select TEMP option box on UUT LCD using rotor switch, press rotor push button and confirm it has a tick against it.
Switch off UUT.

4.2.3.1 Predictive Temperature Accuracy Check

Switch on unit.
IF UUT ?C LED is lit, select MODE followed by SERVICE from the sub menu.
Select TEMP followed by 'C OR F'.
When LCD displays message 'Trend data will be lost', select YES and confirm ?F LED is lit.
Fit predictive oral temperature calibration plug (part no 320-635) in to unit.

Using the ROTOR control select TEMP from the main menu.
Confirm that the Temperature LED displays (starting from the left) show the following sequence

‘?’ then ‘??’, and ‘???’.

Confirm first digit shows ‘-’ indicating an oral probe is fitted.

Confirm LED display indicate 98.6°F (+/- 0.1°F).

4.2.4 Pulse Oximeter Requirements

The operation of the SpO_2 module shall be tested if fitted (TS Model only). If no module is fitted continue from section **4.2.5**.
Switch on UUT.
Enter Service Mode as detailed in section **3.3.2**
Select SYSTEM from sub menu.
Select SYSTEM from sub menu again.
If SpO_2 option box on UUT LCD does not have a tick against it, select box using rotor control, press rotor push button and confirm it has a tick alongside it.
Switch off UUT.

4.2.4.1 Pulse data and saturation data verification

Connect a Nellcor Puritan Bennett™ Pulse Simulator either a model SRC-2, PT-2500 or N-1290 to simulate the oximeter sensor.

Switch on UUT and allow it to initialize.
Select ALARMS from main menu.
Set BPM upper limit to 250.
Set BPM lower limit to 10.
Set SpO_2 upper limit to OFF.
Set SpO_2 lower limit to 50.
Plug in Nellcor Simulator and switch on (N-1290 only).

Test DINAMAP™ *Compact* unit using the full complement of SpO_2 and pulse rate settings available on your simulator.

Confirm unit is within the tolerances given below.

Saturation Tolerance:	70 - 100%	$\pm$2 digits
	50 - 69%	$\pm$3 digits
Rate Tolerance:	$\pm$ 3 beats per minute from 20 - 250 beats per minute.	

4.2.4.2 Pulse Search verification

Set pulse rate to zero on Nellcor Puritan Bennett™ simulator (N1290 only) or disconnect simulator, verify the "No SpO_2 Signal" message is displayed on the UUT LCD. Acknowledge message by pressing rotor switch.

4.2.4.3 Probe Disconnected Verification

After a period of normal operation with a pulse input of 90 applied, disconnect SpO_2 simulator from UUT, verify that the "No SpO_2 Signal" message is displayed on the LCD.
Acknowledge message by pressing rotor switch.
Verify that the "No SpO_2 Sensor" message is displayed on the LCD from the module.
Acknowledge message by pressing rotor switch.
Switch off UUT.

4.2.5 NIBP Requirements

4.2.5.1 NIBP Calibration Check

Note: Proceed to section **4.2.6** if NIBP system has already been calibrated and checked in accordance with section **3.4.1**.

The linearity and calibration for both pressure transducers (PT1 and PT2) shall be verified from 0 to 290 mmHg, the tolerance shall be ? 3 mmHg across the whole range.

Set up unit and calibration kit as per diagram on page 41.
Switch UUT on.
Enter Service mode as detailed in section **3.3.2**.
Select NIBP from sub menu.
Select CHECK from sub menu.

Apply the following pressures as measured by your Pressure Gauge and confirm that the DINAMAP™ *Compact* readings are as per the following table for both PT1 and PT2 channels.

PT1 & PT2 Linearity Check Table

Applied Pressure mmHg (mBar)	DINAMAP™ *Compact* UUT Measured Pressure mmHg
0 (0)	0 -0,+3
58 (77.3)	58 ?3
116 (155)	116 ?3
174 (232)	174 ?3
232 (309)	232 ?3
290 (387)	290 ?3

If the Calibration Check is satisfactory continue from section **5.2.6** otherwise refer to section **3.4.2** of this Manual if calibration is required.

4.2.5.2 Pressure System Leakage Test.

Apply a pressure of 200mmHg (267mBar) to the DINAMAP™ C*OMPACT* unit using the NIBP calibration kit. Confirm that after 36 seconds the pressure has not dropped by more than 5mmHg (6.66mBar).

4.2.5.3 Overpressure Limit Tests

Proceed to section **4.2.6** if NIBP system has already been calibrated and checked in accordance with section **3.4.2**.

4.2.5.3.1 Neonate Overpressure Limit Check

Enter Super Service Mode as detailed in section **3.3.2**.
Select NIBP from Super Service Test menu.
Select VSENSE from sub menu.
Select VAL2 from sub menu.
Increase applied pressure until overpressure failsafe occurs.
Confirm the following:

Pressure at failsafe point is between 150mmHg to 165mmHg (200mBar to 220mBar)
The system pressure falls to less than 20mmHg (26.6mBar) within 4 seconds.
Switch off UUT.

If UUT fails re-calibrate unit as per section **3.4.2**.

4.2.5.3.2 Adult Overpressure Limit Check

Switch on UUT.
Enter Service mode as detailed in section **3.3.2**.

Select NIBP and then CHECK.
Increase applied pressure until overpressure failsafe occurs.
Confirm the following:

Pressure at failsafe point is between 300mmHg to 330mmHg (400mBar to 440mBar)
The system pressure falls to less than 20mmHg (26.6mBar) within 4 seconds.
Switch off UUT and disconnect calibration kit.
If UUT fails re-calibrate unit as per section **3.4.2**

4.2.6 Printer Operation

Switch on UUT.
The operation of the internal printer shall be tested if fitted, otherwise ignore this section.
If printer is fitted and the PRINT option is unavailable on main operational menu of the UUT LCD:
Enter Service Mode as detailed in section **3.3.2**.
Select PRINTER option box on UUT LCD using rotor switch, press rotor push button and confirm it has a check mark beside it.
Switch off UUT and insure a paper roll is fitted in the printer and the printer door is shut.

4.2.6.1 Print Quality

Confirm printer status on LCD indicates ‘Man’.
Select PRINT option from main menu followed by NOW. Check printer output and confirm that all characters are readable and have an even contrast.

4.2.6.2 Printer Error

Open the printer door.
From the main menu select PRINT and NOW.
Confirm that the printer does not start and LCD printer status display indicates ‘No Paper’…

Remove paper and close printer cover.
Confirm that the printer does not start.

Replace paper and close the printer door.
Select PRINT and NOW and confirm printer starts.

4.2.7 Calibration Time Stamp

If all temperature readings correct switch off UUT and switch on again.
Enter Service Mode as detailed in section **3.3.2**.
From the sub menu select **TEMP**.
To record the current time and date as the time and date of calibration select CAL.
Switch off UUT.
Switch on UUT
Enter Service Mode as detailed in section **3.3.2**.
Select INFO and confirm date of NIBP calibration and time and date of TEMP calibration are correct.

4.3 Manual Release Test Results Sheets

Test Section	Test Description	Test Results	PASS	FAIL
4.2.1.1	LED Display	-		
4.2.1.2	LCD Display All Pixels Lit	-		
	UUT Software Revision			
4.2.2.1	UUT Supply Indicator Test External DC LED Operation	-		
	Battery LED Operation	-		
4.2.3.1	Predictive Temperature Accuracy Check Oral/98.6?C			
4.2.4.1	Pulse data and saturation data verification SAT/PULSE			
4.2.4.2	Pulse Search verification			
4.2.4.3	Probe Disconnected Verification			

Test Section	Test Description	Test Results		PASS	FAIL
4.2.5.1	NIBP Calibration Check (Applied Pressure)	PT1 (mmHg)	PT2 (mmHg)		
	0mBar				
	77.3mBar				
	155mBar				
	232mBar				
	309mBar				
	387mBar				
4.2.5.2	Pressure System Leakage Test. Target Pressure				
	Pressure after 36s				
4.2.5.3.1	Neonate Overpressure Limit Check Overpressure Limit				
	Final Pressure				
4.2.5.3.2	Adult Overpressure Limit Check Overpressure Limit				
	Final Pressure				
4.2.6.1	Print Quality	-			
4.2.6.2	Printer Error No paper Door open				
4.2.7	Calibration Time Stamp				

Unit Serial No: **Product Code:**

Test Completed by : **Date:**

5 Trouble Shooting.

UUT Problem	Possible Causes	Further Checks
UUT will not switch on from EXT DC source.	EXT DC adapter o/p out of spec. EXT DC Fuse Blown. PSU Board fault.	Measure o/p. Check Fuse. Swap or test PSU Board. If unit can be powered from a battery source then a fault exists in the external DC detect circuitry on the PSU Board.
UUT will not switch on when powered by Battery.	Battery discharged. PSU Board fault.	Measure terminal voltage of battery. Swap or test PSU Board. If unit can be powered from mains then fault lies on PSU Board Between the Battery and the input to IC7. Check DC_Battery Signal is available to the PIC and confirm operation of USE_Battery switch TR2.
Unit will not switch on from either Battery or EXT DC source.	On/Off switch faulty. +5VD supply low. PIC Processor not running.	Try turning unit on by pressing the rotor switch. If UUT switches on check On/Off signal from Switch Board to PSU Board. Measure +5VD supply on Host Comms Connector +VE Pin 4, -VE Pin 1 and confirm is in spec. Reset PIC by linking Pin 8 to Pin 1 on the Host Comms port momentarily. Then attempt to power on UUT.
No Keyswitch response.	Switch Board failure. Main Board failure.	Swap or test Switch Board. Swap or test Main Board.
No Rotor response.	Rotor failure. Switch Board failure. Main Board failure.	Test Rotor operation. Swap or test Switch Board. Swap or test Main Board.
When Rotor is revolved menus are skipped.	Rotor failure. Switch Board Failure.	Swap or test Rotor Switch. Swap or test Switch Board.
Pressing Rotor Switch fails to switch on unit but menu selection is possible.	PSU Board. Switch Board.	Swap or test PSU Board. Swap or test Switch Board. (Probable D3 O/C)

UUT Problem	Possible Causes	Further Checks
Incorrect or No LCD output.	LCD Board fault. Addressing fault either:- Switch Board or Main Board (will usually be accompanied by an audible alarm if Main Board Processor has stopped running). Negative supply to LCD module, potted down on the Switch Board from the -12v supply, out of spec.	Swap or test LCD Board. Swap or test Switch Board. Swap or test Main Board. Check Negative Supply reaches LCD Module.
No LCD Backlight.	LCD Board fault. Display Board fault. Addressing fault either:- Switch Board. Main Board.	Swap or test LCD Board. Check Operation of backlight switch TR1 and confirm +Vbacklight is present on PL31 Pin 2 w.r.t Pin 1. Swap or test Switch Board. Swap or test Main Board.
Incorrect or No LED display output.	Note: If a partial loss of the LED's is found the fault is most likely to reside on the LCD Display Board. LED Display Board fault. Addressing fault either:- Switch Board or Main Board (will usually be accompanied by an audible alarm if Main Board Processor has stopped running). No or low +4.5V VDISP supply.	 Swap or test LED Display Board. Swap or test Switch Board. Swap or test Main Board. Swap or test PSU Board. Check supply continuity from PSU Board to Display Board.
SpO_2 Probe disconnected error reported on LCD (P00 Error).	Faulty Finger Probe. Faulty SpO_2 Module to Front Panel cable. SpO_2 Module fault.	Test with known good sensor. Swap or check cable continuity. Swap module and test unit with Nellcor SpO_2 Simulator.
SpO_2 No signal error (P55 Error).	Faulty Finger Probe. Faulty SpO_2 Module to Front Panel cable. SpO_2 Module fault.	Test with known good sensor. Swap or check cable continuity. Swap module and test unit with Nellcor SpO_2 Simulator.

UUT Problem	Possible Causes	Further Checks
After UUT power up sequence is complete UUT Alarm Sounds with the following error message displayed on LCD. System Error, P105 or System Error, P110 or System Error, P115	SpO_2 Module fault. Isolated Power Supply Module failure on Main Board. Main Board Processor SpO_2 RS232 comms failure.	Swap SpO_2 module and power up UUT. Check +5VI (+/-0.25V), -15VI & +15VI (+/-1V) isolated supplies are in specification. Swap Main Board and power up UUT.
When the pump starts an NIBP Overpressure warning is displayed on LCD (even without cuff attached to unit) .	Blocked or kinked hose from pump output to front panel. Pneumatic Assembly fault.	Examine hose for kinks or blockage. Check Pneumatic Assembly for blocked output. Swap or test Pneumatic Assembly.
When the pump starts an NIBP Overpressure warning displayed on LCD when a cuff is attached.	Kinked hose to cuff or faulty cuff. Blocked or kinked hose from Front panel to Main Board pressure sensor ML1. Main Board fault.	Test unit with known good cuff. Examine hose for kinks or blockage. Swap or test Main Board (ML1, IC5 or IC7 may be defective).
When an NIBP determination is started pump is laboring i.e. pump sound is lower in frequency than normal. Fault may be accompanied with either of the following warning messages:- 'N33-NIBP Inflation Timeout' or 'N00-NIBP Overpressure'	Kinked hose to cuff or faulty cuff. Blocked or kinked hose from pump output to front panel. Pneumatic Assembly fault.	Test unit with known good cuff. Examine hose for kinks or blockage. Check Pneumatic Assembly for blocked output. Swap or test Pneumatic Assembly.

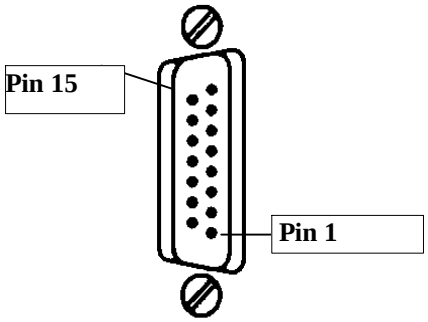
UUT Problem	Possible Causes	Further Checks
N12 Displayed on Systolic display and alarm sounding. LCD display is blank.	State of pneumatic system does not concur with the unit's expected software state. e.g. pressure in system exceeds ambient level despite system being set open to atmosphere. If a failure condition arises in the valve control circuitry that does not allow the cuff to deflate an N12 error will be reported.	Determine status of valve drive and hence locate any valve drive problem. Most likely to be a fault on the Pneumatics Control Gal IC1 or TR1 or TR4 on the PSU board. Therefore swap or test PSU Board. Fault could also be caused by Main Board Failure with IC3 being the most likely cause.
N13 Displayed on Systolic display and alarm sounding. LCD display is blank.	If pump runs continuously on power up or remains on at any time when it is supposed to be off a N13 fault condition will be set.	Most likely to be a fault on the Pneumatics Control Gal IC1 on the PSU board. Therefore swap or test PSU Board. Fault could also be caused by Main Board Failure with IC3 being the most likely cause. Fault could also be due to defective pump current measurement circuitry on PSU Board.
When an NIBP measurement is attempted unit alarms with the following message on LCD. 'N33-NIBP: Timeout Inflation'	Leak in pneumatic system.	Test unit with known good cuff. If unit is leaking check integrity of internal hoses if ok swap or test pump assembly.
When an NIBP measurement is attempted unit alarms with the following message on LCD. 'N44-NIBP: Timeout' Total Time' or 'N55-NIBP: Timeout Pressure' or 'N99- No determination'	N44 and N55 warnings may be caused by excessive movement of patient ('Motion Artifact'). Main Board NIBP circuitry fault or PSU Board pneumatic control fault or Pneumatic Assembly fault	Ensure 'Motion Artifacts' are not the cause of the failure. Carryout an NIBP calibration check this may indicate if their is a problem with either pressure measurement channels PT1 (shown on systolic display) or PT2 (shown on diastolic display). If calibration is satisfactory fault may be due to a pneumatic problem with cuff deflation. The fault may also reside on the NIBP pulse determination circuitry on the Main Board.

UUT Problem	Possible Causes	Further Checks
Unit alarms with the following message on LCD 'Pump Over Current 0,(code line failure),0,0	A pump over current condition has been signaled to the Main Board processor. Pump failure. PSU Board failure of pump current sense circuitry. Main Board failure	 Swap or test Pump Assembly. Swap or test PSU Board. Swap or test Main Board.
Unit alarms with the following message on LCD 'TSH: HE_54CP'	Unit has failed temperature calibration for its 54°F point. Main Board failure most likely.	 Check output of isolated supply module on Main Board +5VI, +/-15VI and VREFI.
Unit alarms with the following message on LCD 'TSH: HE_98CP'	Unit has failed temperature calibration for its 98°F point. Main Board failure most likely.	 Check output of isolated supply module on Main Board +5VI, +/-15VI and VREFI.
Unit alarms with the following message on LCD 'TSH: SE_TACF'	During temperature calibration an error greater than can be compensated for has been detected. Main Board failure is most likely.	 Check VREFI supply.
No response to Host Communications.	PSU Board Main Board fault.	Swap or test PSU Board. Swap or test Main Board. Check continuity of PSU Board to Host Comms Port cable on rear panel.
Remote Alarm Output not operating.	PSU Board or Main Board fault.	Stimulate an alarm condition by adjusting a parameter alarm to a minimum level and applying a higher stimulus to the unit. Check remote alarm output as shown in section 0. Swap or test PSU Board. Swap or test Main Board. Check continuity of cable between PSU Board and Remote Alarm socket on rear panel.

UUT Problem	Possible Causes	Further Checks
Unit alarms with the following message on LCD: 'PIC: +/-12V Out of Spec.' (Filtered Voltage),(Code Line Failure), 0,0	The PSU Board PIC software has detected that the +12VR or -12VR rails are operating out of spec.	Check and isolate faulty supply. Fault is most likely to be on the PSU Board or the Main Board. Fault could also be caused by input voltage to IC18 or IC19 on PSU board going to low and therefore causing the regulators to dropout. This could be caused by excessive current drawn on the +12VV supply or interruptions to the input supply caused by erroneous operation of supply switch TR10.
Unit alarms with the following message on LCD:- 'PIC: Incompatible SW Version 0, (code line failure),0,0	The software has detected an incorrect PIC software version to run with Main Board software.	Check Main Board and PSU Board PIC software compatibility

6 TECHNICAL INFORMATION

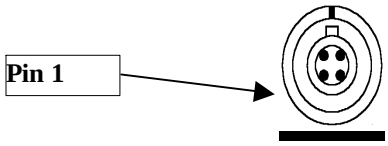
6.1 Host Port Connector (rear panel)



Important! For use ONLY with equipment conforming to IEC-601.

Pin	Function
1	Ground
2	Inverted TTL Transmit Data
3	Inverted TTL Receive Data
4	Fused +5 volts
5	No connection
6	No connection
7	Ground
8	No connection
9	RS232 Request to Send (RTS)
10	RS232 Clear to Send (CTS)
11	RS232 Transmit Data (TxD)
12	No connection
13	RS232 Receive Data (RxD)
14	No connection
15	No connection

6.2 Remote Alarm Connector (rear panel) – if so equipped



Important! For use ONLY with equipment conforming to IEC-601.

Relay contact Maximum rating: 25V AC / 60V DC @ 1 A

Pin	Normal Condition	Alarm Condition
1	Contact Closed	Contact Open
2	Common	Common
3	Contact Open	Contact Closed
4	No Connection	No Connection

Note: Pins are numbered anti-clockwise when viewed from rear of monitor.

6.3 Accessory Part Numbers

Description of Compatible Part	Code
SOFT-CUF™ CUFFS	
Infant, Orange/White	2500
Child, Green/White	2501
Child Long, Green/White	2506
Small Adult, Lt Blue/White	2502
Small Adult Long, Lt Blue/White	2507
Adult, Navy/White	2503
Adult Long, Navy/White	2604
Large Adult, Rose/White	2504
Large Adult Long, Rose/White	2644
Thigh, Brown/White	2505
CLASSIC-CUF™ CUFFS	
Infant	2618
Child	2613
Small Adult	2608
Adult	2603
Large Adult	2643
Thigh	2648
CLASSIC-CUF™ CUFFS, Isolation Use Yellow	
Adult	2602
Small Adult	2607
Large Adult	2642
DURA-CUF® CUFFS	
Infant, Rust	2783
Child, Green	2781
Small Adult, Royal Blue	2779
Adult, Navy Blue with Hanger	2771
Adult, Navy Blue	2774
Adult Long, Navy Blue	2772
Large Adult, Wine	2791
Large Adult Long, Wine	2784
Thigh, Brown	2796
Air Hose, Gray, Adult Pediatric, Screw Connector, 12ft.	107365
Air Hose, Gray, Adult Pediatric, Quick Disconnect, 12ft.	88847
Air Hose, Gray, Adult Pediatric, Screw Connector, 24ft.	107366
Air Hose, Teal, Neonatal, 8ft.	107368
DINAMAP® *Compact* Operation Manual	776980
DINAMAP® *Compact* Service Manual	776856
Pole Stand	3210
Basket	3211
Temperature Calibration Kit	320635

Description of Compatible Part	Code
AC/DC Power Converter	300978
Printer Paper, 10 rolls per box	89100
SpO_2 Extension cable	EC-8
Nellcor Puritan Bennett™ Finger Sensor	DS100A
Oral Temperature Probe, Blue, 21” Coiled	8978
Rectal Temperature Probe, Red	8976
Temperature Probe Covers (5000 per case)	8815

6.4 DINAMAP™ *Compact* Service Spares List

Items available from Service Center:

Pfx	GE Medical Systems P/N	Description/Nomenclature
BAT	633150	Battery, 3V6, 100mAh, NiCd, PCB
BAT	633132	BATTERY 12V 2.3AH LEAD ACID
CAP	604194	CAP, 470uF, 20%, 6V3, ELECT, SMT, 8.0 DIA x 10.0
CAP	604195	CAP, 2200uF, 20%, ELECT, AXIAL
CAP	604169	CAP, 1000uF, 20% 10V, ELECT, Radial, 7.5SP
CAP	604197	Cap, 470uF, 16V, Elect, Radial, 5.0SP
CAP	604198	Cap, 10uF, 16V, Elect, Radial, 1.5SP
CAP	604199	CAP, 220uF, 20%, 25V, ELECT, LOZ, RADIAL, 3.5SP
CAP	604200	CAP, 470uF, 20%, 25V, ELECT, LOZ, RADIAL, 3.5SP
CAP	604201	CAP, 220uF, 20%, 10V, ELECT, LOZ, RADIAL, 5.0SP
CAP	604202	CAP, 150uF, 20%, 16V, ELECT, LOZ, RADIAL, 3.5SP
CAP	604204	CAP, 100uF, l20%, 16V, ELECT, RADIAL, 2.5SP
CAP	604205	CAP, 330uF, 20%, 16V, ELECT, RADIAL, 3.5SP
CAP	606114	CAP, 1u0, 20%, 16V, TANT, SMT, Case A
CAP	606189	CAP, 4u7, 20% 35V TANT SMT CASE C
CAP	606115	Cap, 4u7, 20%, 16V, TANT, SMT, Case B
CAP	606162	CAP, 2u2, 20% 25V TANT SMT CASE A
CAP	606151	CAP, 2u2, 20%, 25V, TANT, SMT, Case A
CAP	606116	CAP, 10uF, 20%, 16V, TANT, SMT
CAP	606117	CAP, 68uF, 16V, TANT, SMT
CAP	606226	Cap, 47u 20%, 10V, TANT, SMT, Size D
CAP	602253	Cap, 470p, 3kV, CER
CAP	602254	CAP, 100pF, 2%, 100V, Low K, CER PL, 2.5SP
CAP	602255	Cap, 0ul, 20%, 100V, MULTI CER, Radial, 2.5SP
CAP	605445	Cap, 47pF, 5%, Multi CER, SMT, 0805 Size
CAP	605736	CAP, 330upF, 5%, 50V, MULTI CER, SMT, 0603 Size
CAP	605446	CAP, 0u001, 5%, 50V, MULTI CER, SMT, 0805 Size
CAP	605628	CAP, 1u0, +80-20%, 16V, MULTI CER, SMT, 0805 Size
CAP	605920	CAP, 22pF, 5%, 50V, MULTI CER, SMT, 0603 Size
CAP	605534	Cap, 0u01, 10%, 50V, Multi CER, SMT, 0805 Size
CAP	605535	Cap, 0u033, 10%, 50V, Multi CER, SMT, 0805 Size
CAP	605157	CAP, 0u39, 10%, 50V, MULTI CER, SMT, 1206 Size
CAP	605536	Cap, 0u001, 10%, 50V, Multi CER, SMT, 0805 Size
CAP	605158	Cap, 1u0, 10%, 16V, Multi CER, SMT, 1206 Size
CAP	605159	CAP, 0u33, 10%, 25V, MULTI CER, SMT, 1206 Size
CAP	605626	CAP, 0ul, 20%, 50V, Multi CER, SMT, 0805 Size
CAP	605627	CAP, 0u47, 20%, 50V, MULTI CER, 0805
CAP	605447	CAP, 330pF, 5%, 100V, MULTI CER, SMT, 0805 Size
CAP	604206	Cap, 0ul, 5%, 63V, Polyester, Radial, 5.08SP
CAP	604207	Cap, 0ul5, 5%, 63V, Polyester, Radial, 5.08SP
CAP	604208	Cap, 1u0, 5%, 63V, Polyester, Radial, 5.08SP
CBL	680388	Wire, 24AWG , 0.56mm, BTC
CBL	680367	Wire, 1/0.6mm, (0.28mm), PVC, BK

Pfx	GE Medical Systems. P/N	Description/Nomenclature
CBL	680387	Wire, 30AWG (0.25mm), Teflon green wrap
CBL	680368	Wire, 16/0.2mm (0.5mm), PVC, BK
CBL	680370	Wire, 16/0.2mm (0.5mm), PVC, R
CBL	680371	Wire, 16/0.2mm (0.5mm), PVC, OR
CBL	680376	Wire, 7/0.127mm (28AWG), PVC, OR
CBL	680377	Wire, 7/0.127mm (28AWG), PVC, Y
CBL	680378	Wire, 7/0.127mm (28AWG), PVC, V
CBL	680380	Wire, 7/0.127mm (28AWG), PVC, W
CBL	683211	Cable, 9 Way, 7/36 AWG, IDC, GY
CBL	683212	Cable, 14 Way, 7/36 AWG, IDC, GY
CBL	683213	Cable, 16 Way, 7/36 AWG, IDC, GY
CBL	683214	Cable, 20 Way, 7/36 AWG, IDC, GY
CBL	683215	Cable, 34 Way, 7/36 AWG, IDC, GY
CBL	683216	Cable, 6 Way, LO NSES, Nellcor, 044385
CBL	683217	Cable, 2 Way, 13/0.2mm, FIG 8
CBL	752304	GROMMET STRIP, 1.3-2.2mm (17-14AWG) PANEL
CBL	756136	Cable Tie, 100L x 2.5W, 16 DIA MAX, NYLN, NATL
CBL	756137	Cable Tie, 100L x 2.5W, 18 DIA MAX, M3, NYLN, NATL
CBL	742147	Sleeving, H/S, 1/8 (3.2mm), BK
CBL	742148	Sleeving, H/S, 3/16 (4.8mm), BK
CBL	742149	Sleeving, H/S, 1/4 (6.3mm), BK
CBL	742151	SLEEVING, H/S 1" (25.4MM) BK
CBL	601186	CABLE, EXTENSION
CHM	782243	ADH, RUBBER/PLASTIC LOCTITE PRISM 406
CHM	782242	ASHESIVE, ETHYL CYANOACRYLATE, RBR, 4105
CON	608240	Pin, Test, Eye Terminal
CON	608241	Pin, Crimp, 'Molex' 4809, Anti Fishhooking
CON	608242	Pin, Crimp, 'Molex', 2478 Anti Fishhooking
CON	608244	Pin, Crimp, Female, 'Hirose', AWG 26-30
CON	704734	Contact, Battery
CON	607978	HDR, 2 Way, STRT, 2.54SP
CON	607979	HSG, 2 Way, STRT, Lock, 'Molex', 2.54SP
CON	607980	HDR, 2 Way, RT ANGL, Lock, 'Molex', 2.54SP
CON	607981	SKT, 2 Way, JMPR, 2.5SP, Black
CON	752290	PLG, 2 Way, DC PWR
CON	607982	HSG, 3 Way, STRT, Lock, 'Molex', 2.54SP
CON	607983	HDR, 3 Way, RT ANGL, Lock, 'Molex', 2.54SP
CON	607984	HDR, 4 Way, RT ANGL, Lock, 'Molex', 3.96SP
CON	607985	HSG, 4 Way, Free, STRT, Lock, 'Molex', 3.96SP
CON	607986	SKT, 4 Way, Pan MT, STRT, CIRC
CON	607987	HDR, 6 Way, STRT, Lock, 'Molex', 2.54SP
CON	607988	HSG, 6 Way, STRT, Lock, 'Molex', 2.54SP
CON	607989	HDR, 6 Way, STRT, 'HIROSE', SMT, 1.25SP
CON	607990	HDR, 2x3 Way, STRT, 'Hirose', SMT, 2.0SP
CON	607991	HDR, 6 Way, STRT, Shrouded, 2.0SP
CON	607992	HSG, 6 Way, Free, STRT, 'Hirose', 1.25SP
CON	607994	SKT, 6 Way, Pan MT, STRT, CIRC
CON	607995	SKT, 9 Way, 'D', RT ANGL, PCB

Pfx	GE Medical Systems. P/N	Description/Nomenclature
CON	607996	SKT, 2x5 Way, STRT, 2.5SP
CON	607997	HDR, 2x7 Way, Shrouded, 2.54SP
CON	607998	Transition, 2x7 Way, IDC, 2.54SP
CON	607999	HDR, 2x7 Way, RT ANGL, Shrouded, 'Molex', 2.5SP
CON	608322	SKT, 2x7 Way, IDC, 2.54SP
CON	608323	SKT, 15 Way, 'D', IDC, PAN MT
CON	608351	HDR, 2 X 8 WAY SHROUDED 2.54SP
CON	608324	HDR, 2x8 Way, RT ANGL, Shrouded, 'Molex', 2.5SP
CON	608325	SKT, 2x8 Way, IDC, 2.54SP
CON	608326	HDR, 2x10 Way, Shrouded, 2.54SP
CON	608327	Transition, 2x10 Way, IDC, 2.54SP
CON	608328	SKT, 2x10 Way, IDC, 2.54SP
CON	608329	SKT, IC, 20 Way, PLCC, SMT
CON	608330	SKT, 20 Way, STRT, PCB, 'Harwin', 2.54SP
CON	608352	SKT, 26 WAY STRT MOLEX FFC, 1.25SP
CON	608331	SKT, IC, 32 Way, PLCC, SMT
CON	608332	HDR, 2x17 Way, Shrouded, 2.54SP
CON	608333	SKT, 2x17 Way, IDC, 2.54SP
CON	608334	Transition, 2x17 Way, IDC, 2.54SP
CON	608335	HDR, 2x20 Way, Shrouded
CON	608336	SKT, 2x20 Way, PCB, 2.54SP
CON	608337	SKT, IC, 44 Way, PLCC, SMT
CUS	633148	PSU, Isolated (633148)
CUS	669141	Transformer (669141)
CUS	320692	Pneumatic Manifold Assembly
ENC	759331	Case, Back, Metal, Sp02, Module
ENC	759332	Case, Front, Plastic, Sp02, Module
ENC	732174	FOOT, SQUARE, 20MM SELF ADHESIVE
ENC	732175	FOOT, ROUND, 12.7 DIA X 3.5H SELF ADHESIVE
FIX	723136	WASHER, M2.5 PLN, STL ZNPL
FIX	715123	Nut, M3, Full, STL, ZnPL
FIX	723133	Washer, M3, PLN, STL, ZnPL
FIX	723134	WASHER, M4 PLN STL ZNPL
FSE	628177	FUSE, 3.15A (T) 20MM, GLASS
FSE	628174	Fuse, 100mA, Resetable, PTC RES, 5.1SP
FSE	628175	Fuse, 2.5A, Resetable, PTC RES, SMT, 9.5x6.7
FSE	617121	FSEHLDR, 20x5mm, PAN MT, Snap
HWR	735326	CARD GUIDE, PCB 114.3L X 6.2W, 4IN CRS
HWR	735327	CARD GUIDE, PCB 75.8L X 6.2W, 2.5IN CRS
HWR	735328	SPACER, PCB, LOCK, 10.0L
HWR	722234	SCREW, KIT, LOCKING, FEMALE DCONN 12.7MM
HWR	736216	Clip, Spring, Knob
HWR	736217	CIRCLIP, 10.5 DIA SHAFT 8.0 DIA GROOVE E TYPE
HWR	736230	CLIP, SPRING, PUSH-ON, 4.0 DIA
HWR	727166	SPRING, TORSION 10.0 DIA 4.6 LG 5 COILS 180 DEG
HWR	740201	TUBING, AYX42007, 1/4 X 1/8
ICS	694143	MC68302FC20 Microprocessor, 16 Bit, 20MHz, 132PQF
ICS	623123	PIC16LC74-04-L MICROCONT 8 BIT ADC 44PLCC

Pfx	GE Medical Systems. P/N	Description/Nomenclature
ICS	694126	IC, 128x8 HIGH SPEED CMOS SRAM SMT
ICS	692252	NM93C46M8 EEPROM, CMOS, 1kBIT, Serial, SO8
ICS	619279	AM29F040A-70JC FLASH CMOS, 4MBIT 5V 32PLCC
ICS	623124	GAL16V8A-15J EE ARRAY PROG 64 X 32, 20PLCC
ICS	692233	MAX163BCWG ADC< 12BIT, Track & Hold, SO24W
ICS	693171	AD654JR Voltage to Freq Converter, SO8
ICS	692256	BU4S71, or Gate, SNGL, S05
ICS	693112	DG444DY SW, Analog, SPST, Quad, SO16
ICS	693126	DG508ADY Multiplexer, 4 CHAN, Analog, SO16N
ICS	693172	MAX7219CNG Driver, 8 Digit LED, DP24.3
ICS	693176	L293DDWP Driver, Push Pull, 600mA, QUAD, SO28W
ICS	693177	78L12ACM Volt REG, +12V, 100mA, SO8
ICS	693178	LT1086-12CT Volt REG, +12V, 1.5A, TO220
ICS	693179	MAX666CSA Volt REG, Dual Mode, +5V, PROG, SO8
ICS	693167	79L12ACD Volt REG, -12V, 100mA, SO8
ICS	693180	LM2577T-ADJ Volt REG, ADJ, +11.6/12.4V, 3A, TO226
ICS	693181	L4960H Volt REG, ADJ, +5V/40V, 2.5A, Heptawatt
ICS	693182	MAX758ACPA Volt REG, ADJ, Current MDE, 750mA, DP8
ICS	693183	MAX758ACSA Volt REG, ADJ, Current MDE, 750mA, SO16
ICS	693184	MAX744ACWE Volt CONV, +6V/16V to 5V, 2A, SO16W
ICS	693185	MAX774CSA DC-DC CONT, INV, -5V/ADJ, 1A, SO8
ICS	691110	TL082CD OPAMP, JFET, Dual, SO8
ICS	691128	CMP04FS Comparator, PRECN, Quad, SO14
ICS	691129	AD620AR OPAMP, Instrumentation, LO PWR, SO8
ICS	691139	AD822AR OPAMP, FET, SINGL/Dual SUPP, Dual, SO8
ICS	691147	LM392M OPAMP, FET, SNGL, Dual, SUPP, Dual, SO8
ICS	691109	LM358D OPAMP, HI GAIN, Dual, SO8
ICS	691117	IC, LM386 AUDIO POWER AMP SUR MOUNT
ICS	693111	4051BD Multiplexer, 8 CHAN, Analog, SO16
ICS	691148	4066BM Switch, Analog, Bilateral, QUAD, SO14
ICS	692253	74HC32D or Gate, 2 Input, QUAD SO14
ICS	692254	74HC14D Inverter, CMOS, Schmitt TRIG, HEX, SO14
ICS	692139	74HC03D NAND, 2 Input POS, Open DRN, QUAD SO14
ICS	692112	74HC259D Addressable Latch, 8 Bit SO16
ICS	692255	74HC138D Decoder, 3 to 8 Line, SO16
ICS	692250	74HC574DW Flip Flop, D Type, POS Edge, OCTAL, SO20
ICS	692113	74HC541DW Buffer, Tristate, OCTRAL NON INV, SO20W
ICS	691145	74HC00D NAND Gate, 2 Input POS, QUAD, SO14
ICS	691146	74HC4020D Counter, Binary, 14 Stage, SO16
ICS	694140	MAX809TCUR Supervisory, Microprocessor, SOT23
ICS	692208	X9312US EEPOTR, 50k, Digitally Controlled, SO8
ICS	693170	AD586JR Volt REF, PRECN, 5V, SO8
ICS	692251	NE555D Timer, SNGL, SO8
ICS	694141	MAX232ACWE TxRx, Dual, RS232, +5V, PWRD, SO16W
ICS	694142	MAX691ACSE Supervisory, Microprocessor, SO16
IND	669218	Inductor, 100uH, 1.4A, 0.213 OHM, 5.0SP
IND	669219	Inductor, 47uH, 1.6A 0.1 OHM, 10.0 DIA, 5.0SP
IND	669220	Inductor, 100uH, 1.2A, 0.22 OHM, 10.0 DIA, 5.0SP

Pfx	GE Medical Systems. P/N	Description/Nomenclature
IND	669221	Inductor, 100uH, 1.2A, 0.23 OHM, 13.0x9.4, SMT
IND	669222	Inductor, BLM21A05, NSE Suppression, SMT, 0805 Size
IND	669223	Inductor, BLM32A07, NSE Suppression, SMT, 1206 Size
IND	669224	Inductor, BLM41A01, NSE Suppression, SMT, 1206 Size
IND	669225	Choke, 120uH, 1.7A, 0.095 OHM, 16L x 7.0DIA, Axial
IND	669226	Choke, Wide Band 2.5 t, J8FE-1153-NC
IND	618111	Filter, EMI, 28uH, 100 OHM, 100mA, 3 Line
IND	669231	FERRITE, SLEEVE SNAP SS28B2031
IND	669232	FERRITE, SLEEVE SNAP, SS28B2033
IND	669227	Ferrite, CYL, EMI ATTEN, H8FE-1111-NC
IND	669233	FERRITE, EMI ATTEN H8FE-1134-WC W/CLIPS
IND	669234	FERRITE SLEEVE, EMI ATTEN, H8FE-1135-NC
IND	669228	Ferrite, CYL. EMI Atten. H8FE-1137-NC
LAB	774172	Tape, Copper, Adhesive, EMI Shielding 25.4W
LAB	774173	Tape, Adhesive, Double Sided 25.4W
LAB	774175	Tape, Tinned copper, ADH, EMI Shielding
LAB	774176	TAPE, ADHESIVE, D/S, 19W
MET	614207	Display, Graphics, LCD MGL(S)-24064
MET	690173	Printer, HTP-4050, 60.0W Paper, 5V
MSC	662208	MPX7050GP Gauge, Pressure, Side Port, 0-7.3psi
MSC	770130	PAPER, PRINTER PTP ROLL
MSC	621262	CONV, AC-DC 90-240V 47-63HZ TO 24VDC 1.5A CON B5
MSC	645189	Module, Sp02, Nellcor MP204P
OPT	614215	HLMP4719, LED, Yellow, TI-3/4, 5.0 DIA.
OPT	614208	HLMP4740 LED, Green, TI-3/4, 5.0 DIA.
OPT	614210	HLMP-T200 LED, RED, Rectangular, 5.7x3.2, 2.54SP
OPT	614211	HDSP-A153 LED, RED, 7 SEG, COM Cathode, 7.6mm
OPT	614212	HDSP-H153 LED, RED, 7 SEG, COM Cathode, 14.2mm
OPT	614213	HDSP-5703 LED, YELLOW, 7 SEG, COM Cathode, 14.2mm
OPT	614214	MPY54C569, Cell, Photoconductive, CdS, 3.4SP
OPT	625111	HCPL2601 Optocoupler, High CMR, SNGL, DP8, GULL
OPT	625112	4N35 Optocoupler, GaAs, NPN, SNGL, SO6, GULL
RES	652386	RES, 15RO, 1%, 1/8W, MF, Axial
RES	652387	RES, 1k00, 1%, 1/8, MF, Axial
RES	652388	RES, 3k0, 1%, 1/8W, MF, Axial
RES	652389	RES, 9k1, 1%, 1/8W, MF, Axial
RES	652390	RES, 16k, 1%, 1/8W, MF, Axial
RES	652391	RES, 24k, 1%, 1/8W, MF, AXIAL
RES	659227	RES, 221k, 1%, 1/4W, MF, SMT, 1206 Size
RES	659228	RES, 332k, 1%, 1/4W, MF SMT, 1206 Size
RES	658125	RES, 4R7, 5%, 1/2W, CF, Axial
RES	650258	RES, ZERO OHM 0805 SIZE
RES	685632	RES, 0R0, SMT, 0805 Size
RES	685633	RES, 1RO, 1%, 1/10W, SMT, 0805 Size
RES	685634	RES, 2R7, 1%, 1/10W, SMT, 0805 Size
RES	685635	RES, 10R0, 1%, 1/10W, SMT, 0805 Size
RES	685636	RES, 47R, 1%, 1/10W, SMT, 0805 Size
RES	685637	RES, 100R, 1%, 1/10W, SMT, 0805 Size

Pfx	GE Medical Systems. P/N	Description/Nomenclature
RES	685638	RES, 150R, 1%, 1/10W, SMT, 0805 Size
RES	652392	RES, 220R, 1% 1/10W SMT 0805 SIZE
RES	652396	RES, 510R, 1% 1/10W SMT 0805 SIZE
RES	685640	RES, 510R, 1%, 1/10W, SMT, 0805 Size
RES	685641	RES, 750R, 1%, 1/10W, SMT, 0805 Size
RES	685642	RES, 1k00, 1%, 1/10W, SMT, 0805 Size
RES	652393	RES, 1K10, 1% 1/10W SMT 0805 SIZE
RES	685643	RES, 1K2, 1%, 1/10W, SMT, 0805 Size
RES	652394	RES, 1K3, 1% 1/10W SMT 0805 SIZE
RES	652397	RES, 1K8, 1% 1/10W SMT 0805 SIZE
RES	685645	RES, 2K00, 1%, 1/10W, SMT, 0805 Size
RES	685646	RES, 2k2, 1%, 1/10W, SMT, 0805 Size
RES	685647	RES, 3k3, 1% 1/10W, SMT 0805 Size
RES	685648	RES, 4K30, 1%, 1/10W, SMT, 0805 Size
RES	685649	RES, 4K7, 1%, 1/10W, SMT, 0805 Size
RES	685650	RES, 5k1, 1% 1/10W, SMT 0805 Size
RES	652395	RES, 5K6, 1% 1/10W SMT 0805 SIZE
RES	685651	RES, 6k2, 1% 1/10W, SMT 0805 Size
RES	685652	RES, 7k50, 1%, 1/10W, SMT, 0805 Size
RES	685653	RES, 9K1, 1%, 1/10W, SMT, 0805 Size
RES	685654	RES, 10k, 1% 1/10W, SMT 0805 Size
RES	685655	RES, 10k7, 1% 1/10W, SMT 0805 Size
RES	685656	RES, 12K, 1%, 1/10W, SMT, 0805 Size
RES	685657	RES, 13k, 1% 1/10W, SMT 0805 Size
RES	685658	RES, 15k0, 1%, 1/10W, SMT, 0805 Size
RES	685659	RES, 16k9, 1% 1/10W, SMT 0805 Size
RES	685660	RES, 18K, 1%, 1/10W, SMT, 0805 Size
RES	685661	RES, 20K0, 1%, 1/10W, SMT, 0805 Size
RES	685662	RES, 24K, 1%, 1/10W, SMT, 0805 Size
RES	685663	RES, 27K, 1%, 1/10W, SMT, 0805 Size
RES	685664	RES, 30K, 1%, 1/10W, SMT, 0805 Size
RES	685665	RES, 49k9, 1% 1/10W, SMT 0805 Size
RES	685666	RES, 43K, 1%, 1/10W, SMT, 0805 Size
RES	685667	RES, 47K, 1%, 1/10W, SMT, 0805 Size
RES	685668	RES, 51K, 1%, 1/10W, SMT, 0805 Size
RES	685669	RES, 68K, 1%, 1/10W, SMT, 0805 Size
RES	685670	RES, 82K, 1%, 1/10W, SMT, 0805 Size
RES	658671	RES, 100k, 1% 1/10W, SMT 0805 Size
RES	685672	RES, 150K, 1%, 1/10W, SMT, 0805 Size
RES	685673	RES, 200K, 1%, 1/10W, SMT, 0805 Size
RES	685674	RES, 510K, 1%, 1/10W, SMT, 0805 Size
RES	685675	RES, 820K, 1%, 1/10W, SMT, 0805 Size
RES	685676	RES, 1MO, 1% 1/10W, SMT 0805 Size
RES	685677	RES, 1M43, 1%, 1/10W, SMT, 0805 Size
RES	685678	RES, 2M00, 1%, 1/10W, SMT, 0805 Size
RES	685679	RES, 10M0, 1%, 1/10W, SMT, 0805 Size
RES	655137	RES, 3R3, 5%, 3W W/W VIT AXL
RES	655135	RES, OR1, 5%, 2.5W, W/W, Cemented, Axial

Pfx	GE Medical Systems. P/N	Description/Nomenclature
RES	685680	RES, 11OR, 0.1% 1/10W, MF, SMT, 0805 Size
RES	685681	RES, 511R, 0.1% 1/10W, MF, SMT, 0805 Size
RES	685682	RES, 549R, 0.1% 1/10W, MF, SMT, 0805 Size
RES	685683	RES, 1k07, 0.1% 1/10W, MF, SMT, 0805 Size
RES	685684	RES, 750R, 0.1% 1/10W, MF, SMT, 0805 Size
RES	685685	RES, 1k21, 0.1% 1/10W, MF, SMT, 0805 Size
RES	685686	RES, 1k78, 0.1% 1/10W, MF, SMT, 0805 Size
RES	685687	RES, 1k82, 0.1% 1/10W, MF, SMT, 0805 Size
RES	685688	RES, 2k15, 0.1% 1/10W, MF, SMT, 0805 Size
RES	685689	RES, 4k99, 0.1% 1/10W, MF, SMT, 0805 Size
RES	685690	RES, 6k81, 0.1% 1/10W, MF, SMT, 0805 Size
RES	685691	RES, 10k0, 0.1% 1/10W, MF, SMT, 0805 Size
RES	658692	RES, 13k7, 0.1% 1/10W, MF, SMT, 0805 Size
RES	685693	RES, 15k0, 0.1% 1/10W, MF, SMT, 0805 Size
RES	685694	RES, 19k6, 0.1% 1/10W, MF, SMT, 0805 Size
RES	685695	RES, 30k1, 0.1% 1/10W, MF, SMT, 0805 Size
RES	685696	RES, 44k2, 0.1% 1/10W, MF, SMT, 0805 Size
RES	685697	RES, 68k1, 0.1% 1/10W, MF, SMT, 0805 Size
RES	685698	RES, 499k, 0.1%, 1/10W, MF, SMT, 0805 Size
RES	630301	POTR, 1k0, 10%, 1/2W, CER, Top ADJ, 20t, 3/8 SQ
RES	630302	POTR, 20k, 10%, 1/2W, CER, Top ADJ, 20t, 3/8 SQ
RES	630303	POTR, 2k2, 20%, 0.15W, Top ADJ, 1t, 10x5 SP
SCD	610145	30VF20F Diode, Fast RECVRY, 4.7A, 200V, TO252
SCD	610146	DE3L20U Diode, Fast RECVRY, 3A, 200V, E Pack
SCD	611149	EC10DS2 Diode, RECTR, 1A, 200V, SMT, 5.0x2.5
SCD	611150	DIF20 Diode, RECTR, 1A, 200V, SMT, 5.0x2.5
SCD	611151	D2F20 Diode, RECTR, 1.4A, 200V, SMT, 57.6x4.0
SCD	611152	NSD03A20 Diode, RECTR, 3A, 200V, SMT, 8.0x4.0
SCD	611153	Bar 43, Diode, Silicon, Schottky, 100mA, 30V, SOT23
SCD	611154	1N5817M Diode, Schottky, 1A, 14V, MELF, 5.0x2.4
SCD	611155	1N5819M Diode, Schottky, 1A, 28V, MELF, 5.0x2.4
SCD	611156	LLBAT43 Diode, Silicon, Schottky, 200mA, 30V
SCD	610147	SS14 DIODE, SILICON SCHOTTKY, 1A 40V
SCD	610148	SS34 DIODE, SILICON SCHOTTKY, 3A 40V
SCD	611157	SM4T36C Diode, Suppressor, Transient Volt, SOD6
SCD	611158	LL4148 Diode, Silicon, Small Signal, SMT
SCD	612152	BZX55C5V1 ZRN, 5V1, 500MW DIODE
SCD	612149	BZX84C5V1 Diode, Zener, 5.1V, 350mW, SOT23
SCD	612150	BZX84C33 Diode, Zener, 33V, 350mW, SOT23
SCD	611159	TL431CLP Diode, Volt REF, ADJ, PRECN, TO92
SCD	611160	TICP106M RECTR, Silicon CONT, 2A, 600V, TO92
SCD	673120	IMH3A NPN, Base RES, Dual, SO6
SCD	674102	2N4401 NPN, TO92
SCD	674142	MMBT2222A NPN, SOT23
SCD	674143	BC857C NPN, SOT23
SCD	674144	BC212 PNP, MED PWR, TO92
SCD	674126	MMBT2907A PNP, SOT23

Pfx	CRITIKON U.S. P/N	Description/Nomenclature
SCD	676105	VN10KM NFET, Enhancement Mode, TO237
SCD	676168	BUK581-60A NMOS, SOT223
SCD	676140	2N7002 NMOS, Enhancement Mode, SOT23
SCD	676129	2N7000 NMOS, Enhancement Mode, TO92
SCD	676153	Si941ODY NMOS, Enhancement Mode, SO8
SCD	676156	Si9955DY NMOS, Enhancement Mode, Dual, SO8
SCD	676169	ME4P06F PMOS, TO252
SCR	719324	SCREW, M2.5 X 8MM, PAN, SDRV, STL, ZNPL
SCR	719322	Screw, M3x6mm, Pan, SDRV, STL, ZnPl
SCR	719325	SCREW, M3 X 10MM, PAN, SDRV, STL, ZNPL
SCR	721123	Screw, M3x8mm, CHS, SLTD, NYLN
SCR	719326	SCREW, M4X6 PAN SDRV STL ZNPL
SCR	719327	SCREW, M4X10 PAN SDRV STL ZNPL
SCR	719328	SCREW, M3X12MM, INSERT, PSM
SDR	600121	Speaker, M/C, 8 OHM, 0.2W, 1.5 DIA (38.1mm)
SDR	600122	Sounder, Piezoelectric, 4kHz, 20.00DIA
SWS	665127	Switch, SPST, Key, RF15, Non ILLUM, 15.0SQ
SWS	665128	Switch, SPST, Key, RF19, Non ILLUM, 19.0SQ
SWS	665129	Switch, SPST, Key, RF15, ILLUM, Red, 15.0SQ
SWS	666119	Encoder, OPT CPLD, 16 Way, Rotary, W/Pushbutton
SWS	648122	Relay, DPDT, 2A, Coil 12V, 400 OHM
TDC	662207	MPX7050D, Sensor, Pressure, 0-7.3psi, Case 344
XTL	609137	Crystal, 19.6608MHz, HC49/SD3
XTL	609138	Crystal, 32.768kHz, 4 PIN, SMT, 9x3
XTL	609139	Crystal, 4MHz, HC49, SMT, Short

6.5 Procedural & Error Alarm Code Table

Alarm Code	LED Display	LCD Display	Audio Tone & Volume	Effect of Alarm Silence switch	Effect of Clear via Rotor	Probable Cause
N99 N55 N44 N33 N00	No change	N99-NIBP FAILED N55-TIMEOUT: PRESS N44-TIMEOUT: TOTAL N33-TIMEOUT: INFLATE N00- OVER PRESSURE	High priority alarm. Volume adjustable.	2 minutes silence	Clear	Unable to make an NIBP determination due to insufficient signal. One cuff pressure for > 1 minute. Motion artifact. Determination time exceeds 2 minutes. Motion artifact. Inflation time > 40 seconds or air leak detected. Overpressure detected.
N12	Systolic Display 'N12'	N0 Display	Steady tone, maximum volume	No effect	No effect	System pressure whilst idle 5 or 15mmHg above ambient for 30 seconds for a neonate or an adult cuff respectively
N13	Systolic Display 'N13'	No Display	Steady tone, maximum volume	No effect	No effect	Pump on/off status determined by measurement of pump current does not concur with Main board software expected status. Unit will power down within 30 seconds of detected failure..
P55 P00	No change	P55-SpO_2: NO SIGNAL P00-SpO_2: NO SpO_2 SENSOR	High priority alarm. Volume adjustable.	2 minutes silence	Clear	No or very low SpO_2 signal. Check or reposition sensor. SpO_2 sensor not connected. No sensor code detected. Sensor failure.
E33 E11 E00	No change	E33-Temp: FAIL E11-Temp: FAIL E00-Temp: FAIL	High priority alarm. Volume adjustable.	2 minutes silence	Clear Clear Clear	Temperature probe not connected or inoperable. Predictive temperature loss of tissue contact > 30 sec. Removal of probe before temperature determination complete. Predictive temperature determination exceeds 60 sec.

Procedural & Error Alarm Code Table continued

Alarm Code	LED Display	LCD Display	Audio Tone & Volume	Effect of Alarm Silence switch	Effect of Clear via Rotor	Probable Cause
No code	No change Blank No change Blank	Low Battery Flashing battery icon Low Battery - System Disabled Printer - No Paper NIBP Range error	3 beeps every 10 sec, adjustable volume. Steady tone, maximum volume High priority alarm Volume adjustable High priority alarm Volume adjustable	2 minutes silence No effect 2 minute silence 2 minute silence	No effect No effect Clear Clear	Replace or recharge battery. From onset of alarm, 5 NIBP measurements available. Beep linearly increases rate as battery discharges. Replace or recharge battery. NIBP measurement disabled. Paper expired or printer door open. NIBP algorithm returned value outside specified accuracy rage.
Other: N,P,E,I,S.	Blank	Error code, description	Steady tone, maximum volume	No effect	No effect	Internal system fault

7 Glossary Of Terms and Abbreviations

AC : Alternating Current
ADC : Analog to Digital Converter
ADU : Analog to Digital Units:-

Main Board ADC has 4096 steps which equates to 5V full scale (1.2207mV/Bit)
PSU PIC processor ADC has 256 steps which equates to 5V full scale (19.531mV/Bit)

AM : Amplitude Modulation
BPM : Beats Per Minute
DC : Direct Current
DMM : Digital Multi-Meter
FET : Field Effect Transistor
FPT : Filtered Pressure Transducer
GAL : Gate Array Logic
Hz : Hertz
ITU : Intensive Therapy Unit
LCD : Liquid Crystal Display
LED : Light Emitting Diode
MAP : Mean Arterial Pressure
NIBP : Non Invasive Blood Pressure
NiCd : Nickel Cadmium
PSU : Power Supply Unit
SPI : Serial Peripheral Interface
TTL : Transistor to Transistor Logic
UUT : Unit Under Test
VAC : Volts Alternating Current
VDC : Volts Direct Current
VFC : Voltage to Frequency Converter

8 Service Diagrams

This section include the part lists, assembly drawings and circuit diagrams for the following boards for unit revision levels 02, 04, 06:

I. *Compact* NIBP Monitor Block Diagram 8600EB
II. Main Board 8610 (8760 on unit revision 06)
III. Power Supply Board 8620
IV. Display Board 8630
V. Switch Board 8640
VI. Printer Board 8650